PB93-231090

How to Locate and Acquire Japanese Scientific and Technical

How to Locate and Acquire Japanese Scientific and Technical Information

Proceedings of the Conference
held March 18-19, 1993 in San Francisco, California

Sponsored by
The Japanese Information Center of Science and Technology
and
The National Technical Information Service

NTIS Supervising Editor, Barbara Payne
Executive Editor, Mindy L. Kotler
Managing Editor, Susan M. Lusk
Production Editor, Benet J. Wilson
Intern, Ellen Stanfield

This report has been prepared by the Japan Information Access Project for the National Technical Information Service and the Japan Information Center of Science and Technology.

For sale by the National Technical Information Service, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161; (703) 487-4650. Price $56. NTIS Order Number PB93-231090. Add $3.00 per order for shipping and handling.

Table of Contents

Luncheon Speaker, Day One

Part III. Suppliers of Japanese S&T Information

Part IV. How to Obtain and Use Japanese Patent Information

Opening Address, Day Two

Part V. Experiences of Information Users

Part VI. Building Human Networks

Luncheon Speaker, Day Two

Part VII. Developments in Computer-Assisted Access

Part VIII. Creating a Program for Japanese S&T Information within your Organization

Part IX. Directory

U.S. Department of Commerce Japan Technology Program

The Japan Technology Program carries out the mandates of the Japanese Technical Literature Act of 1986 and the U.S.-Japan Science and Technology (S&T) Agreement of 1988 for the Department of Commerce. It is part of the Office of the Assistant Secretary for Technology Policy. It was established in 1987 as the Japanese Technical Literature Program, and with the accretion of duties under the U.S.-Japan S&T Agreement and the creation of the Technology Administration, renamed the Japan Technology Program.

Japan's skill in acquiring and utilizing foreign information to develop commercially applicable technologies spurred the enactment of the Japanese Technical Literature Act. The act directs the Secretary of Commerce to increase the availability and understanding of Japanese technical information by coordinating federal government activities and by working with industry.

The United States signed the head-of-government U.S.-Japan S&T Agreement to cooperate in research and development in science and technology, and to ensure equitable flows of technology. The Japan Technology Program coordinates implementation of the Agreement for the department, and undertakes negotiations to ensure Japanese-initiated international R&D programs provide equitable benefits to all participants. Major negotiations underway include the international Intelligent Manufacturing Systems (IMS) feasible study and discussions related to Japan's Real World Computing Initiative on possible bilateral optoelectronics module fabrication.

Major Activities

Technical Literature - Serves as the focal point in U.S. government for activities related to acquisition, translation, and dissemination of Japanese technical literature; obtains and abstracts Japanese scientific and technical documents in cooperation with the National Technical Information Service (NTIS); and chairs the interagency Japanese Technical Literature Committee to coordinate activities and to make more information available to the private sector.

Information Dissemination - Produces directories of Japanese technical resources in the United States and Japanese technical documents entered into the NTIS collection; commissions and publishes reports on important Japanese technologies and R&D practices; publishes a quarterly newsletter; sponsors conferences; and provides business counseling to companies seeking to monitor Japanese S&T developments.

Policy Actions Related to Technology Flows - Advises policy makers in the federal government and U.S. industry on, and implements as directed, provisions of the U.S.-Japan S&T Agreement; works with the National Science Foundation to encourage U.S. researchers to visit and work in Japan; and monitors emerging trends in impact of these trends on flows of information and technology.

For further information and assistance, contact:
Japan Technology Program
U.S. Department of Commerce
Room 4817
14th Street and Constitution Avenue, N.W.
Washington, D.C. 20230
Telephone: (202) 482-1287

Introduction

This volume presents the proceedings of a conference entitled "How to Locate and Acquire Japanese Scientific & Technical Information," held on March 18-19, 1993, in San Francisco. Sponsored by the Japan Information Center of Science and Technology (JICST) and the U.S. National Technical Information Service (NTIS), the conference presents an important step taken to fulfill the 1988 U.S.-Japan Agreement on Cooperation in Science and Technology.

If these proceedings bear witness to one thing, it is the commitment of government on both the U.S. and Japanese sides to improve bilateral research cooperation and to remove any obstacles to the free flow of information that may arise from lack of familiarity with the appropriate knowledge diffusion mechanisms in each national system.

U.S. government speakers included senior officials charged with implementing the Science and Technology Agreement, including Dr. Joseph Clark, Acting Director of the Commerce Department's Office of International Technology Policy and Programs and Dr. Tamami Kusuda of the Japan Technology Program. Remarkably, too, despite the distance from Tokyo to San Francisco, Japanese counterparts of these officials also appeared. While Japanese funding may have made the conference possible, it was the highly visible presence of authoritative Japanese speakers and their accessibility to questions from the American audience that made the conference so successful.

Rockwell, 3M, du Pont, Xerox, Westinghouse and the top names in American international high-technology business likewise sent presenters, as did major information vendors from the United States and Japan, covering all points on the spectrum from consumers to suppliers. Innovative ventures in publishing (NIKKEI Telecom), research (National Science Foundation), and nonprofit services (the Japan Information Access Project) lent further depth to the proceedings.

As a result of the conference, and this, the accompanying conference volume, smaller American businesses now have available to them a comprehensive overview of the "information ecology" of both the United States and Japan, with a frame of reference for their orientation and specific people to contact for help in getting started.

Part I of the conference volume contains speeches covering the future of the bilateral S&T relationship with views from the United States and Japan. Part II

presents American efforts to collect, monitor and use Japanese scientific and technical information. Part III discusses the types of information produced in Japan, the suppliers, and the channels of distribution.

Part IV describes how to obtain and use Japanese patent information. Part V tells the experiences of information users, while Part VI offers practical information on how to build human networks by acquiring information through friendships, colleagues, and counterparts.

Part VII reviews developments in computer-assisted access, what is available, actual experiences, and future trends. Part VIII explains how to create a program for Japanese S&T information within your own organization.

The aforementioned sections are complemented by a special Part IX, a directory of all presenters and exhibitors at the conference, along with many other sources of Japanese information. The directory is contributed by the Japan Information Access Project, which plans to produce a larger, stand-alone directory of this type to be published at regular intervals.

Welcoming Speech

Welcoming Speech

Mr. Ron Lawson, Acting Director, NTIS

It is particularly gratifying to be a part of the Third Annual Conference on How to Locate and Acquire Japanese Scientific and Technical Information because it exemplifies some of the best aspects of the relationship between the United States and Japan. By this, I mean both sides working hand-in-hand to achieve a meaningful objective.

In the late 1970s, American researchers began realizing that a substantial gap existed in their knowledge of what their counterparts in Japan were producing. Further, it became apparent that certain barriers existed to the easy access to S&T information being generated in Japan. Foremost among these apparent barriers are the differences in language and the ways in which S&T information is traditionally handled.

Several congressional hearings were devoted to Japanese S&T information, and the Japanese Technical Literature Act was passed in 1986. Further, the U.S. and Japanese Governments also agreed to include provisions for a Joint Working Group for S&T Information Transfer in the 1988 U.S.-Japan Agreement for Cooperation in Science and Technology.

The Japanese government responded to the problem in a positive way at the highest levels. The Prime Minister's Office asked JICST (The Japan Information Center of Science and Technology) to take steps to make it easier for foreigners to gain access to Japanese S&T information. As part of its response, JICST asked NTIS to help it organize a series of conferences on the subject.

At that time, there had already been several national and international conferences on Japanese S&T information. However, they addressed policy, competitiveness, and technical issues and were aimed at specialist in the field. It was decided to aim the new series of conferences at those who are on the front lines of attempting to acquire Japanese S&T information. It would feature presentations by those who had been successful in their pursuit of Japanese S&T information, as well as those who could provide access points to it. Emphasis was to be on the practical.

Thus, a desire on the part of the U.S. to gain better access to Japanese S&T information, combined with a Japanese desire to make its S&T knowledge base more accessible to non-Japanese, has resulted in a highly successful conference series. I sincerely hope that all of you will find this Conference as useful and stimulating as have the participants in the previous conferences in the series.

Keynote Address

The U.S. & Japan: The Technological Relationship*

Professor Michael Harrison, Computer Science Division, University of California-Berkeley

Over the past dozen years, circumstances have drawn me into a variety of U.S.-Japanese interactions, academic, commercial, and policy related. To set the context, I have spent almost all of my career as a professor at the University of California at Berkeley specializing in computing. The university is a truly cosmopolitan community and we have had the pleasure of hosting many important foreign researchers. This has included a number of Japanese scientists who are now prominent leaders of academia and industry. The rapid growth of computing at Berkeley in the late 1960s and the 1970s created severe space shortages and we lost touch with many foreign researchers. As it turned out, so had many American researchers.

Technology Assessments

In the early 1980s, the Computer Science and Technology Board of the National Research Council was asked to examine international developments in computer science. Agencies such as NSF had become concerned at the insular attitude of U.S. researchers who submitted proposals for funding plausible research projects. NSF would seek peer reviews and find that most of the reviewers would respond favorably but some reviewers would point out that someone abroad had done the work several years ago and would even supply references.

Industrial members of the Board were more concerned by the rapid expansion of the Japanese market share in consumer electronics, microelectronics, and computing. Then, Japan announced the Fifth Generation Computing Project [2] at a conference in Tokyo in 1982. This conference was reported as a major Japanese attempt to achieve global leadership in computing. Competing national programs were proposed in Britain, the U.S. and elsewhere.

*This research has been sponsored in part by the Defense Research Projects Agency (DARPA), under Contract N00039-88-C-0292, monitored by Space and Naval Warfare Systems Command and under Grant MDA972-92-J-1028. The contents of the information in this paper does not necessarily reflect the position of the government.

As part of the reaction to that event, I was appointed the Chairman of the National Research Council's Panel on Microelectronics and Computer Science. We assembled a panel of distinguished people and spent two weeks in Japan visiting key laboratories and universities to evaluate the state of Japanese technology. Subsequently, a series of Japanese Technology Evaluation Program (JTECH) studies were established through other sponsorship. They followed the model of our first panel. These panels spend only one week in Japan and then write a report on the state of Japanese R&D in their area. Of course, one week is not enough time to investigate an active area, but the panels are carefully selected and the members are diligent.

There have been over twenty reports and most are useful. I served on the first JTECH Panel and also served as the Chairman of a Panel on Advanced Computing in Japan in 1990. Recently the program has been expanded to focus on all countries, not just Japan. The opportunities for new collaborations arising from the end of the Cold War are significant.

There are a number of U.S. activities in Japan which support technological evaluation. These include the NSF office, the ONR office in Tokyo, and office of the American Electronics Association. One important resource is Dr. David Kahaner of the Tokyo Office of ONR. Dr. Kahaner attends many conferences and visits laboratories. Voluminous reports are written which are distributed over Internet to interested parties. His electronic mail address is KAHANER@XROADS.CC.U-TOKYO.AC.JP. It is the depth and timeliness of his reports on a wide variety of areas that make them invaluable.

On the Japanese side, JICST provides an important service in reviewing foreign, i.e., not Japanese, work in all areas of science and technology. NTIS performs the same function for U.S. work. These services are not restricted.

It turns out that some U.S. private companies maintain internal services to monitor Japanese activities. I am personally acquainted with efforts at IBM and MCC. Certain government agencies have a charter to monitor critical programs which could affect national security. A certain small European country maintains a disproportionally large staff in Japan to monitor S&T. Much more information on international competition in computing may be found in [1].

Pressures on U.S.-Japanese Cooperation

The technological relationship between the U.S. and Japan has been stressed by persistent trade imbalances. During the previous two U.S. administrations, the U.S. and Japanese played well-rehearsed roles. The Japanese pointed out the U.S. debt, deficit, and low savings rate. On the other hand, the U.S. complained about artificial impediments to trades. There is a great deal of merit in both positions. It is prudent to listen to political pronouncements, but it is essential to watch what is actually being done. For example, the Bush administration eschewed "industrial policy." On the other hand, they realized the need to support high-performance computing. A national program was set up in high performance computing and funding was made available. This was considered proper behavior by the administration because "a national program is not a form of industrial policy."

The new Clinton administration has stated its determination to improve the U.S. economy through growth in jobs and in exports. Inflammatory language has been used and xenophobia seems on the rise in many countries. In fact, this is the time for international cooperation especially in science and technology. Now is the time to do high-energy physics by building one semiconducting super-collider by pooling funding and sharing access. It does not matter if the super-collider is in Europe, America, or Asia. Similar remarks apply to the Japanese space program. One senior executive told me of his apprehension prior to a visit by then-U.S. Department of Commerce Secretary Robert Mosbacher. He expected to be challenged on his company's failure to use U.S. space technology which was more advanced and cheaper. There was no "politically correct" answer. Fortunately for my friend, the secretary never raised the issue.

Changing Financial Times

There are a number of financial issues that influence the U.S.-Japan relationship.

- the U.S. deficit
- the Japanese real estate market
- the Japanese stock market

There are thousands of articles on these topics, ranging from scholarly publications to newspaper articles. A popular theme can be summarized as denial. That is, the deficit and debt are claimed to be a modest burden. Have you ever met a real-estate salesman who thought a property was overvalued and this was a poor time to buy? This is not the forum for me to enter these debates except to state that the deficit is a real problem and must be faced. Likewise, the Japanese markets seem overvalued and corrections must be expected.

Trade progress, a problem for both the U.S. and Japan, is an area on which real progress must be made. The U.S. needs to have the benefits of Japanese manufacturing expertise, engineering advances, and products. The Japanese need access to U.S. research and technology especially computer software and computer architectures, and Japan needs access to the huge U.S. market.

A Case Study in U.S.-Japan Cooperation

Let us consider a true story about one venture which illustrates the advantages of cooperation. This is the tale of a real company -- Gain Technology Inc. -- which was founded by Pehong Chen and myself.

In 1988, I was engaged in DARPA-funded university research and we were working on advanced environments for document and programs. Pehong Chen was one of my Ph.D. students and the senior student on our research project. The department had an industrial liaison program to attract funding for a new building. Under this agreement, a large Japanese corporation sent a young researcher Ikuo Minakata, to work on our project. This was a wonderful experience for everyone. For Minakata-san, he worked in a cooperative group, learned new technologies, and had a good time. From my perspective, we had another young, talented researcher who generated new ideas, and our research flourished. Joint papers were published.

In 1988, P. Chen received his doctorate and joined a local research laboratory. During that year, he and I became interested in starting a new software company. By this time, Minakata-san had returned to Japan. As Dr. Chen and I developed our ideas, our Japanese friend provided some marketing information. We invited him to join our start-up. He remained loyal to his company but asked instead if we were interested in obtaining funding from his firm. As a result of writing my book [1], I had met a consultant to the senior technical person in the same company. Our two friends, one American and one Japanese, made inquiries on our behalf. We went to Japan and met some key

people including Board members. The timing could not have been better in that the company was looking for a strategic software partner. It was decided within three days that we were interested in working together but our ideas needed further work. The company offered a job to Dr. Chen and offered me consulting for the summer to develop the ideas further. At the end of the summer, we would decide if they would fund the company. While this involved little risk for me, Dr. Chen was a young family man who had been working at his job for less than one year. He demonstrated his confidence by instantaneously announcing that he would quit his job upon his return to the U.S. Our former colleague, Minakata-san, was to return to the U.S. to help us. Over the next months, the business plan and technology were developed. The plans were accepted and the company was incorporated. Here are some key points.

- The goal was to develop a comprehensive UNIX-based multimedia system
- A team of ten Japanese engineers worked with Gain in its Palo Alto offices
- An international (multi-lingual) product was developed on time

Although the deal between Gain and its partner is a private matter, some aspects can be discussed. The Japanese partner provided the personnel mentioned and funding. There was no equity participation by the Japanese partner. The American team developed most of the software while the Japanese team dealt with Japanese language input/output.

The technology was jointly owned with special marketing rights. While the details remain private, the key lesson is that it was possible to craft a creative deal which met the specific needs of both partners. The actual contract is a curious document and is essentially a memorandum of our agreements. Whenever a new question or opportunity has arisen, a compromise agreement has always been reached amicably if not always quickly.[1]

The company grew from the two founders to over one hundred people in less than three years. Gain has had essentially all of the UNIX market share for multimedia. In September of 1992, Gain was acquired by Sybase. The deal

[1]When a new concept or an unexpected suggestion is made, decision making may be suspended for *nemawashi* or consensus building. The effect on business is similar to that of "garbage collecting in software systems."

was satisfactory to the Japanese partner, all of whose rights have been preserved. The terms were attractive for the Gain shareholders as there was no external equity participation. This venture was so successful because the partners trusted one another. Each party got what they needed and there were numerous other joint efforts collateral to the main business of Gain Technology, but which were mutually beneficial.

Conclusions

The U.S. Japanese relationship is special and very important. It is vitally important to both sides. There are great opportunities to do on a large scale what was done in our small example of Gain Technology. If the two countries can cooperate as well as compete, new key technologies and cost-effective products can be developed and the world can become a safer and more prosperous place for everyone. After all, “A rising tide will lift all ships.”

References

[1] David H. Brandin and Michael A. Harrison. *The Technology War*. John Wiley and Sons, New York, 1987.

[2] T. Moto-Oka, editor. *Fifth Generation Computer Systems*. Japan Information Processing Development Center, North Holland Publishing Company, 1982.

Part I. The Future of the Bilateral S&T Relationship: Views from Japan and the United States

The Future of the Bilateral Science and Technology Relationship: View from Japan and the United States

Mr. Yoshinari Akeno, Deputy Director, Science and Technology Information Division, Science and Technology Agency

This conference is being held as one of the cooperative activities based on the Japan-United States Science and Technology Cooperation Agreement. It is designed so that the people of the United States can gain a broad understanding of the ways in which Japanese scientific and technical information can be efficiently obtained and put to use. The first and second conferences were held in Washington, but I feel the fact that this third conference was held in San Francisco, a city near the Silicon Valley, which is internationally famous in the high-tech industry has extremely profound significance.

The theme of my speech is "The Future of the Bilateral Science and Technology Relationship: View from Japan." As a premise, I would like to explain the basic thinking behind Japanese science and technology policies as well as the concrete measures that the Japanese Government is discussing as cooperative activities between Japan and the United States, in particular the aspects of those measures dealing with the flow of science and technical information. Following this, I would like to take a look at the future of those matters.

In January 1992, the latest direction in Japanese science and technology policy was indicated in the recommendation entitled, *Comprehensive and Basic Science and Technology Policy Toward the New Century* submitted to the Prime Minister. In April 1992, based on this proposal, the *Basic Policy for Science and Technology* was decided upon at a government cabinet meeting. Let us introduce the content of that basic policy in simple terms.

This new science and technology policy was enacted in light of the heightening international concern with issues common to all mankind, such as changes in the international conditions, global environmental problems, natural resource and energy problems,and food problems which emerged amidst the end of the Cold War between the East and West. Because of this new international situation, there were demands that Japan fulfill the responsibilities and duties commensurate with its international standing. A consensus resulted on the need for Japan to make positive contributions for all of mankind through science and technology. Japanese are often criticized as being economic

animals, but it should be pointed out that the Japanese consciousness has gradually undergone a change from a desire for material wealth to a desire for mental and psychological affluence.

Japan's science and technology is considerably strong in terms of applicable technology. It has become clear, however, that in comparison with this strength, its science and technology is weak in terms of basic research. As a result, there is an increasing awareness of the need to strengthen basic research in Japan, especially in the public fields, and to consider the accumulation of the new knowledge, called "intellectual stock" which is for the use of all humans, as well as to make the structure of science and technology more balanced.

The new science and technology policy was established in this light. It has the following three objectives:

1. Coexistence of human beings in harmony with the earth

2. Expansion of intellectual stock

3. Construction of an experimenting society where people can live with peace of mind

The following are a few examples of the important measures that ought to be promoted in order to substantiate these objectives. One of these measures is the "expansion of investment in research and development." The structure of Japan's investment in research and development is such that an extremely high proportion of this investment goes toward research and development for insuring industrial competitiveness. In order to balance out this situation, we intend to make efforts to double government investment in basic research and development as soon as possible.

Another measure is the "activation of research and display of creativity." We intend to develop a center of excellence which has a system for promoting the exchange of researchers, and has an outstanding research environment where top researchers from Japan and abroad will gather.

Measures will also be taken for the "intensification of international science and technology activities." In order to advance major international joint research and promote the appointment and reception of foreign researchers, we are planning to take measures to provide a research system and environment which is open to the international community.

In terms of the flow of scientific and technical information, the strengthening of functions for the mutual exchange of international information is indicated in this last measure and is intended to intensify liaisons with foreign countries through the formation of an international network, expansion of an English-language database for papers and government publications, and provide a system for promoting access to this database.

This explains Japan's current science and technology policy. Based on this fundamental way of thinking, the Japanese government is putting a variety of policies into action and, in conforming with these policies, implementing specific cooperative activities with the United States. Next will follow specific cooperative activities between Japan and the United States in the area of the flow of scientific and technical information.

The activities to be introduced now are based on the four initiatives agreed in the Japan-U.S. Task Force on Scientific and Technical Information, which was set up under the Japan-United States Science and Technology Cooperation Agreement. The first initiative is to improve awareness and understanding of organizations and systems established to improve the use of scientific and technical information (STI). The JICST/NTIS conference represents one concrete measure taken to meet this objective.

The second initiative is to increase the quantity and quality of STI. To achieve this goal, efforts are being made primarily through JICST, the National Center for Science Information Systems (NACSIS), and the National Diet Library (NDL). For example, JICST has created an English-language database for information on scientific and technical literature, including research reports of Japanese governmental organizations, and on research topics at national and public research organizations. These database services have been available since 1987 through the international scientific and technical information network STN International. This English-language database is also available through JOIS, an online service of JICST.

In addition, JICST has published the English version of the *Annual Report on Science and Technology in Japan* issued by the Science and Technology Agency. The title of the report is the *White Paper on Science and Technology.* It describes the recent trends and present status of S&T activities and policies of Japan with data and statistics.

The National Center for Science Information Systems (NACSIS) has expanded its databases related to the research and information of Japanese universities and academic societies and is currently offering them to researchers from the United States through the U.S. Library of Congress and the U.S. National Science Foundation. Information is also being exchanged by the National Diet Library (NDL) through exchange programs with overseas organizations such as the Library of Congress.

The third initiative is to reduce impediments to the flow of scientific and technical information. In cooperation with academic societies, publishing and authors' associations and the Japanese government, the Japan Reprographic Rights Center was established in September 1991. This is a private organization functioning in a way similar to the Copyright Clearance Center in the United States.

The fourth initiative is to increase the translation of scientific and technical information. We are investigating the possibility of a joint project on Japanese-English, machine-aided translation.

The next matter does not directly concern the flow of scientific and technical information, but rather the exchange of researchers. From the perspective of promoting the exchange of researchers with the United States and the other countries, we are setting up a science and technology fellowship system as well as a variety of other invitational systems. In addition, since 1990, a summer institute program has been implemented in which science and engineering graduate university students from the United States are invited to Japan during their summer breaks and given the opportunity to undergo approximately eight weeks of summer training at Japan's national research institutes, private corporations, and other organizations. These programs are being expanded.

Through the efforts of both Japan and the United States, all these measures have been highly praised by the Joint High Level Committee, held in Washington last September. The increase in global environmental problems, the growing disparity between the North and the South, food and energy problems and other issues common to mankind will be linked to science and technology. There is also a need to grapple with mega-science such as space stations and nuclear fusion. In light of the globalization of science and technology activities, there is an increasing need for the countries of the world to come together and cooperate in the fight. I think Japan and the United States, in particular, are expected to contribute to the world while deepening their cooperation as technologically advanced nations.

In order to deepen the cooperative relationship between Japan and the United States in the fields of science and technology, in addition to strengthening its efforts in the area of basic research, the Japanese government intends to make efforts to expand the diffusion of the results of this research and other information overseas and to expand the exchange of researchers.

Finally, I hope this JICST/NTIS Conference fulfills one important role in order to actually strengthen the functions for mutually distributing scientific and technical information between Japan and the United States.

An Update on the U.S.-Japan Agreement for Cooperation in Science & Technology

Dr. Joseph E. Clark, Acting Director, Office of International Technology Policy and Programs, U.S. Department of Commerce

Since the 1988 signing of the U.S.-Japan Agreement for Cooperation in Science & Technology, technical collaboration between our nations has progressed significantly. This annual conference is one important way that we have increased our mutual understanding and built a stronger foundation for S&T cooperation that is mutually beneficial.

One major focus of the agreement is on scientific and technical information. As the U.S. co-chair of the Task Force on Scientific and Technical Information, I am proud of the candid and fruitful discussions we have held.

In 1989 we agreed on four goals for the Task Force, which have continued to be our focus as the Japanese co-chair has been passed from Mr. Setsuo Matsuzawa, to Mr. Yasutsugu Takata, and to Mr. Junichi Yamaji. Our goals still are to

1) Improve awareness and understanding of organizations and systems established to improve the use of S&T information ("Mutual Understanding")

2) Increase the quantity and quality of S&T information ("STI")

3) Reduce impediments to the flow of S&T information ("Reprographic Rights")

4) Increase the translation of S&T information ("Translation")

Over the years we have made some significant accomplishments. I will highlight just a few.

Progress Toward our Goals

(1) Improve awareness and understanding of organizations and systems established to improve the use of scientific & technical information (mutual understanding).

To begin, we jointly developed a comprehensive report on the current status of distribution of S&T information between Japan and the United States. Both sides reported on a) basic government policy toward effective distribution of Scientific and Technical Information (STI), b) the status of STI information centers, and c) international distribution and cooperation in STI.

Several reports and studies were undertaken in order to understand better the process by which Japanese STI can be accessed by technical experts from the United States. Survey results from the Science & Technology Agency (STA) and Mitsubishi Research Institute indicated the need to improve access to Japanese technical reports, doctoral dissertations and technical bulletins/newsletters.

At the request of the U.S. side, the Japan Information Center of Science and Technology (JICST) has been providing the National Technical Information Service (NTIS) with videotapes that describe the capabilities and facilities at Japanese laboratories and that portray other related information helpful to American scientists planning to visit, live or work in Japan. Overall, the tapes have been found to be of significant value to the small number of individuals who have thus far used them prior to visiting Japan.

(2) Increase the quantity and quality of scientific and technical information (STI).

The Task Force has defined its scope of activities by listing the types of scientific and technical reports produced by government agencies or through major government-sponsored or government-supported R&D programs that are not published in readily available professional literature. Thus our focus has been more clearly defined and the Task Force has been able to concentrate its efforts on the exchange of STI. In pursuing this goal, the National Center for Science Information System (NACSIS), the Japanese academic information network, has provided 18 databases containing information on grants, university doctoral theses, conference papers and other such information to the National Science Foundation (NSF) and the Library of Congress.

The National Diet Library (NDL) has added staff and increased its budget by $1 million for collection of such literature. NDL is distributing its information to the Library of Congress, the University of California at Berkeley, and the University of Chicago. Such material includes large quantities of technical books, periodicals, and related materials.

The Japan Information Center for Science and Technology (JICST) has played a large role in facilitating Japanese information for U.S. consumption. It has begun doing machine translation of its bibliographic database into English, and produced and distributed a referral database (J-Grip File) which covers ongoing and completed research publications at public research organizations in Japan. The JICST files are accessible electronically on the JICST Online Information System (JOIS) and STN International. In addition, JICST has increased distribution in the U.S. of the annual White Paper and the monthly publications of *STA Today*.

(3) Reduce impediments to the flow of scientific & technical information (Japan Reprographic Right Center).

Many years ago, Japan began exploring the establishment of a "copyright clearance center" similar to those established in other industrialized nations. With the aid and encouragement of the Task Force, a public-private consensus developed on the need for such an organization in Japan. Thus the Japan Reprographic Right Center (JRRC) was established in September 1991, and announced at the March 1992 annual conference. Publishers, authors and academic societies in Japan were active in its start-up. About 1200 Japanese companies have completed agreements with the Center. This major accomplishment is due in large part to the excellent cooperation and open dialogue fostered by the Task Force.

(4) Increase the translation of scientific & technical information (translation).

Obtaining proper legal rights to distribute English translations of Japanese publications has been a concern of Americans interested in U.S. distribution of Japanese publications. JICST and NTIS have initiated an experimental mechanism to assist those seeking permission from Japanese authors to distribute translations of their technical works. Contrary to initial expectations, there have been few requests to use this arrangement yet. The few cases that have been handled under this arrangement have been processed successfully but slowly.

JICST has begun using machine-aided translation (MAT) extensively, in order to increase the English-language content of the JICST bibliographic database.

Cooperation between Japanese and American MAT researchers has been initiated, and the lead responsibility for fostering this cooperation has been transferred to this Task Force from the Information Science & Technology Liaison Group. In addition, a Japan Technology Evaluation Center (JTEC) study team visited Japan in 1990, and published a report on the state-of-the-art of machine translation. The report has helped both the U.S. and Japan to explore cooperation in R&D on the next generation of MAT technology.

New ways of cooperation between the two countries are being explored for the future development of MAT technology. In November 1992, Japanese researchers participated in a U.S. conference in San Diego on the evaluation of MAT systems. A joint U.S.-Japan workshop is scheduled for late 1993.

Another milestone under this goal is that two U.S. government sponsored research consortia have been established. The first is the Lexical Development Consortium based at the University of Pennsylvania, and the second is the Consortium for Lexical Research based at the New Mexico State University. There has also been discussion of possible cooperation and resource-sharing with Japan's Electronic Dictionary Research Institute.

Conclusion

The U.S. and Japan have mutually recognized the importance of maintaining an equitable exchange of information as defined in the Science and Technology Agreement. The Task Force on Scientific and Technical Information ensures that programs and other mechanisms of information exchange are established and properly executed. The Task Force will continue to encourage additional programs and improve on the ones already in progress.

The program to collect videotapes, as presented in the First Goal, has had significant value; however, this service is currently under-utilized. In addition, difficulty in acquiring good quality tapes with significant technical relevance has been experienced. We hope that these deficiencies will soon be remedied.

Under the Second Goal, the National Diet Library is being encouraged to continue to expand its U.S. distribution of material to other universities and research centers. In addition, the U.S. and Japanese sides need to continue to investigate ways to improve the use of NACSIS and other online databases available at the National Science Foundation and the Library of Congress.

In regard to the Third Goal, Japan is heartily congratulated on the establishment of the Japan Reprographic Right Center. The JRRC and the Copyright Clearance Center of the U.S. should be actively encouraged to conclude a reciprocal agreement on the exercise of the right which they administer.

The Fourth Goal needs the most action and attention. Translation of materials is crucial and essential to an equitable exchange of information with the United States. The Task Force needs to actively pursue ways to cooperate on machine-aided translation, to research and develop the next generation of this technology and related technologies such as Optical Character Recognition, and we need to ensure that the funds are available to utilize this technology. The U.S.-Japan workshop tentatively scheduled for late 1993 is an exemplary step toward cooperation in this area.

In closing I should note that JICST and NTIS have done a fine job of organizing these Annual Conferences on Improving Access to Japanese Scientific & Technical Information. The participants have not only described their services, but also shared their information search techniques and procedures. The high level of participation and the very positive evaluations from hundreds of participants clearly indicate the success of these conferences. These annual conferences serve as an excellent model for additional efforts to improve mutual understanding of STI systems and their use.

Thus, this Third Conference is being held in San Francisco. This is the first such conference held outside the Washington, D.C. area, and I am certain that it will be as successful as the previous conferences.

Part II. American Activities to Monitor and Utilize Japanese Information

Monitoring Japanese Activities-- In English

Ms. Hillary Handwerger, Director of the Manufacturing Information Resource Center, National Center for Manufacturing Sciences

The National Center for Manufacturing Sciences is a consortium of U.S. and Canadian owned corporations committed to making North American manufacturing globally competitive through development and implementation of next-generation manufacturing technologies. The organization traces its roots to the early 1980s when a concern began to emerge about America's ability to competitively produce advanced technology for both defense and commercial needs. The consortium was formally incorporated in November 1986. We currently have over 160 member companies, both large and small.

NCMS works to bring together many companies in collaborative projects which leverage their insights and dollars to develop new technology initiatives and to ensure their adoption within the North American industry base. Besides hard technology issues, the National Center for Manufacturing Sciences addresses management, human resource development, and infrastructure needs. There is also a major initiative to support the informational needs of our member companies. That is where the Manufacturing Information Resource Center fits in to the overall NCMS initiative. We hope to improve the competitiveness of our members by making sure that each of their business decisions is an informed one.

The Manufacturing Information Resource Center has been set up to serve both the information and research needs of our project managers and our member companies. We have four goals:

1. **Acquisition**, being the most effective source of national and international manufacturing information and research.

2. **Management** of the information that we capture so that data and materials are rapidly accessible for a variety of purposes.

3. **Dissemination**, using our various research, database, and publication capabilities to disseminate information as needed.

4. **Awareness**, by making industry, and our members in particular, aware of the resources that are available to them so that they will broaden their information seeking beyond their immediate environment.

To meet these goals and serve our constituents, we have developed an extensive collection of materials that are used internally and can be borrowed by our members. This includes books, technical and market research reports, journals, videos and training materials, and translations of pertinent materials that we are able to identify. We provide research services and an online database, again for both internal and member use. In the near future we will be opening the Information Center's capabilities and services to non-members.

How does this relate to our monitoring of Japanese information? As NCMS sets up its research agendas and investigates potential research projects, we look around the world to determine what is being done elsewhere in these areas, and what the potential market and long-term trends are for various technologies. And as we continue to develop selected programs, we need to be constantly aware of related research and developments, internationally, that impact what we are currently doing. NCMS is monitoring international activities, almost entirely, through English-language sources.

The following are typical sources of information that we use to monitor Japanese research and business activities. Much of this information originates in Japan, but not all.

Research Activity Sources

Reference:

Pacific Research Centres: A Directory of Scientific, Industrial, Agricultural, and Biomedical Laboratories, Longman

Engineering Research Centres: A World Directory of Organizations and Programmes, Longman

Materials Research Centres: A World Directory of Organizations and Programmes, Longman

Directory of Japanese Technical Reports, NTIS

Directory of Japanese Technical Resources in the U.S., NTIS

Journals:

Advanced Composite Materials: The Official Journal of the Japan Society for Composite Materials, VSP BV

Advanced Powder Technology: The International Journal of the Society of Powder Technology, Japan, VSP BV and the Society of Powder Technology

Advanced Robotics: The International Journal of the Robotics Society of Japan, VSP BV and the Robotics Society of Japan

Advanced Coatings & Surface Technology, Technical Insights

Advanced Manufacturing Technology, Technical Insights

International Journal of the Japan Society for Precision Engineering, JSPE

New Technology Japan, JETRO

JSME International Journal, The Japan Society of Mechanical Engineers

NTIS Alert: Foreign Technology, U.S. DOC, National Technical Information Service

JPRS Report - Science & Technology, Japan, Foreign Broadcast Information Service

Databases:

JICST-E

JGrip

Inspec

Compendex Plus

World Patents Index

NTIS

OCLC, EPIC

Business/Industry Information Reference:

Directory of Japanese-Affiliated Companies in the USA & Canada, JETRO

Japan Trade Directory, JETRO

Directory of American Electronics Companies in Japan, AEA Industry Committee

Standard Trade Index of Japan, Japan Chamber of Commerce and Industry

Journals:

Asiamac Journal, Adsale Publishing

Asian Wall Street Journal

Business Tokyo: The U.S. Executive's Key to Japan, Keizaikai

Digest of Japanese Industry & Technology (DJIT), Japan Trade & Industry Publicity, Inc.

Japan High Tech Report, World Business Publications

Japan-U.S. Business Report, Japan Economic Institute of America

Japanese Technical Literature Bulletin, U.S. DOC, Japan Technology Program

Tokyo Business Today, Toyo Keizai

Venture Japan: The Journal of Global Strategic Alliances, Investment Dealers Digest

Databases:

Comline: Electronics

Comline: Industrial Automation/ Mechanical Engineering

ABI/Inform

PROMT

Newsnet

Datatimes

General information

Reference:

How to Find Information about Japanese Companies and Industries, Washington Researchers, Ltd.

Inside U.S. Trade, An Inside Washington Publication

JEI Report, Japan Economic Institute

Yomiuri Report from Japan, The Yomiuri Shimbun

We use these materials and many more database and CD-Rom products that have Japanese related information as part of their international focus, to provide current awareness of research, technologies and industry information. We also use these resources to answer research questions having to do with Japanese related business or research activities posed by members or our Project Managers and their committees.

Then we go one step further. Our catalog of MIRC-owned materials, which includes the citations of papers of proceedings and pertinent articles from journals as well as all our books and reports, is all entered into the NCMS TRACK database system which is an online system our staff and members can sign onto and search themselves. Beyond this catalog of materials, we have been receiving the Comline Electronics and Industrial Automation files weekly for the last two

years, those records are also in the file, as are records of new technologies from Technical Insight's *Alerts*. Since last October, we have been loading the NTIS Report abstracts file (from 1990 on) into TRACK. And beginning this month we will be loading the UMI tapes for ABI/INFORM, both abstracts and full text; and we are now testing U.S. Patent Abstracts tapes on our system. All these records and more, (we expect to have about 800,000 records in our file by the end of 1993), are available to be searched for information.

About 11 percent of the materials currently in our files discuss Japan or Japanese developments in some form. So current business information and some research reports and technological developments are available, in a single file in NCMS TRACK, for our users to search.

Translations are another issue.

There is a lot of technical and economic research going on in Japan that is published, but difficult to find out about, and not translated into English. We have a number of member companies that travel to Japan regularly on business, or have divisions in Japan that can and do identify and retrieve important reports for us. The NCMS staff goes on or leads various trips to the Far East where they are given materials. We have also used the services of Comline to find materials that we would like to have. Many of the Japanese reports listed in the NTIS tapes or through JICST-E may have an English-language abstract or citation, but the report itself is in the original language.

When we find pertinent reports, we then have a number of issues to deal with in getting translations of the reports -- not least of which is the small number of proficient Japanese translators in the United States. When you compound this with the slowness of a good quality translation and its costliness, the quantity of materials that can actually be translated is small. We are trying to get around this problem using machine translation, with the help of Interlingua and by sharing the costs of translation projects with other organizations. NCMS is jointly translating the five-volume text of the Intelligent Manufacturing Systems (IMS) proposals with Sematech and MCC.

Because NCMS is a consortia of member companies, we have yet another problem with translations which has to do with copyright law. When we translate, it is not expected that the materials would be held

closely within our company. Our translations, once completed, are shared with our member companies and our project committees. We therefore need to get permissions to translate these materials. Starting in 1990, we tried getting permission to translate reports, by going directly to the publisher and requesting permission; more than 18 months later and with a good deal of interdiction from NTIS, we finally got our permission to translate and distribute copies of reports to members. Since that experience, we have used NTIS and our translators to help us with these permissions and have been a good deal more successful.

However, in getting ready for this presentation, I put myself in the shoes of a novice and sent out some requests for translation permissions-- one request went to the Copyright Permission Officer at *Nikkan Kogyo Shimbun-sha* and the other to JETRO Publications Department acting for the Japanese Reprographics Rights Center. Both letters were sent in early December, we have gotten no replies to date.

We are hoping to be able to set up some agreements with various institutes in Japan (as we have in the Ukraine) that will give us both rapid access to pertinent documents and permissions to translate. We are willing to distribute these documents outside our membership.

Although NCMS is not yet the "information machine" we would like to be, and we do not yet have the staff and language requirements to make us fully proficient in monitoring Scientific and Technical Information of Japan, we are doing our best to put the capabilities in place for a cohesive information strategy for all science and technology. As I have stated, we are currently monitoring publications for items of interest and able to search the English language literature (and some Japanese works) to find answers to research requests. During this next year we hope to be able to access more translations or rights to translate and to start looking at the information we gather to put it in the context of other industry developments, markets, and trends.

We hope also to be able to provoke our members to be more assertive in their information demands and make them better citizens of this information age. The access we provide to research services, our publications and translations, and the NCMS TRACK database are all designed to meet this goal. Access to Japanese science and technology is just one piece of the puzzle.

The du Pont Perspective: American Activities to Monitor and Utilize Japanese Information

Dr. James Nottke, Director, Technology Acquisition, E.I. du Pont Nemours & Company

This paper has come out much differently than I anticipated. I was aware of how I obtained technical information from Japan and I assumed that most other du Pont professionals who needed such information obtained it in a different way. But such is not quite the case. As Director for Technology Acquisition, I need to get the information from Japan before it appears in the databases. Once it is in the databases it is available to everyone, and I want to have it first.

Everyone knows du Pont, but in fact we tend to be known outside du Pont as a chemical company, or a fibers company, or a paint company, or an agricultural products company. We are all those and much more, and most of us inside du Pont have difficulty grasping just the major aspects of the du Pont that we live in. Du Pont has about $40 billion in annual sales. About half of that is in petroleum products and the associate businesses that have evolved in the decade since we purchased Conoco. The other half of the sales are in what we term the chemicals and specialties, or C&S side of the corporation. Du Pont is mostly a chemicals and materials producer that sells to downstream industrial customers that convert those products into end-user products. These range from basic chemicals such as sulfuric and nitric acids, titanium dioxide, and hydrogen peroxide to engineered materials such as fibers, packaging films, and automotive paint, to finished products such as Silverstone cookware, Stren fishing line, and Remington shotguns and shells. My message is that du Pont is in many markets with many types of products based on many, many technologies. And with about half of our sales outside the United States, we are geographically broad as well. So our technical information needs are highly varied.

When I tell you where we are in our interactions with Japan today, I think I must first contrast it with where we were just 15 or 20 years ago so that you see how much we have changed. Obviously, I think it is that change and the rate of change that have shaped how we get technical information from Japan. Fifteen years ago we had a few joint ventures

and these were generally "arms-length" deals in which we carefully controlled the flow of technical information from the parent company, which meant the information flow from the JV was also weak and of a competitive nature. And we had some modest export sales. When I made my first business trip to Japan in 1978 to look for possible sources of new lubricants and antistats to be used on fibers, I was briefed ahead of time, but unprepared for the technical breadth and depth in Japan and the way the industries were organized. In fact, most of our technical information came from technology scouting trips, technology trading trips and participation in very, very few technical conferences each year. In contrast, I note that JICST was in its rapid growth stage at that time.

So let us fast-forward 15 years; how do we at du Pont monitor and utilize technical information from Japan today? To prepare this presentation I was about to pick up the phone and call Rita Ayers, who heads up corporate information science in du Pont, when it occurred to me that was not how I proceeded when I needed information of a technical sort from Japan. And then it occurred to me that if they wanted the perspective of an information professional, they would have invited one. So rather than start with our very competent information resource people, I thought of a couple situations in which I had wanted information of a specific nature from Japan, and mentally walked my way through the path I had followed.

In addition, I started talking with a number of technology transfer and business development people that work on my hall in the du Pont building, one of whom was in the final stages of an out-licensing deal with a Japanese company. I also contacted a few scientists and engineers and later some business people with a variety of assignments that required them to keep track of certain types of technical activity in Japan. It was soon clear to me that there was no common methodology and there was no common major source or conduit, but it did appear that people doing certain types of work got their information in common ways.

Let me emphasize that my "research" for this presentation was neither comprehensive nor particularly scientific, but based on data gathered informally from about 25 people across du Pont. These professionals were selected because I knew that their work involved their knowing what was going on in Japan and that they were perceived, by myself at least, to be good at it. They were people in ongoing positions, not

newcomers to a job, but people looking for information inside their field of competence. From these discussions, I created the categories shown in **Figure 1.**

The “researchers” were senior bench scientists and engineers in the corporate labs or in support of major businesses. The “new business development” people were involved in commercializing new polymer-based products and do it well. The “patents and licensing” people that I have mentioned refer to their work on applications or out-license technology.

As I collected data on how people obtained their technical information from Japan, it became apparent how deeply and broadly du Pont had become involved with Japan. Each person I talked to had their contacts or network or consultant in Japan. To be able to finish my story, I need to take two charts to tell you how involved we are today, because that allows you to understand why people use and rely on the sources that they do.

Figure 2 is a chart that gives an incomplete, but representative, overview of du Pont activity in Japan. Don’t worry about any of the details, just look at the big picture. The senior vice president of one of our eight business segments is located in Japan. He has all of the electronics business worldwide. We have numerous businesses and JVs, many with an associated R&D unit, in Japan. These are researcher exchanges of three months to a year that have occurred in the last year. We make a number of grants to higher education. Although not on the chart, we also invest in a high-tech venture capital fund in Japan, with the purpose of gathering information. We belong to several consortia, the most notable is that we are the first foreign, full member of the ISTEC consortium on high temperature superconductivity in Japan and have a resident researcher there. We participate in a number of conferences, I have just listed a few major ones in which we play a leadership role, or in the case of the PPC, we helped found.

We also have innumerable Japanese companies as suppliers, both in Japan and in the United States. In fact Kao and Takemoto Oil and Fat Company supply fiber finishes to us. In addition, Kao bought High Point Chemical and Takemoto bought Goulston, two of our U.S. finish suppliers.

In **Figure 3**, I mention a number of activities in the United States. Researcher exchanges from Japanese customers, hosting Japanese faculty who are on sabbatical, training of Japanese employees of joint venture companies. Language training is an interesting item. For the last few years about 20 or 30 researchers at our corporate labs are voluntarily learning Japanese, mostly to be able to interact more effectively, not just informally converse with Japanese. We have translators and interpreters, and an increasing number of native Japanese as U.S. employees. Electronic mail sits there on the chart as a single word, but it ought to be 10 inches high. With the time zone difference from the United States and Europe, e-mail is of enormous benefit. And then I list the categories of publications, databases, and studies that we read, use and purchase.

Figures 4 and 5 outline how du Pont obtains Japanese information. We have no broad centralized general monitoring of technical information from Japan, and in retrospect I am not surprised. Most information is based on individual initiative and experiences and for most, timeliness is more important than completeness.

Let me now quickly go through those users that I introduced you to a few charts back. The researchers get and scan the English abstracts of selected society journals and technical periodicals. They attend one or two Japanese conferences per year and are on the mailing lists for summaries and reports, which are more common in Japan, and almost always available in English. They get some of the ever-increasing number of newsletters. E-mail with their network in Japan is a major source. And finally patent awareness, although I was disappointed at how few researchers were following the patent literature today.

The new business development people who target the Japanese market all travel to Japan one to five times per year. They consider it to be inconvenient, but critical to success. There is some reliance on multi-client studies and less use of personal networking than the researchers. Several people had commercial entities in Japan on a retainer to look for and forward specific categories of information. They consider such information services in the United States to be inferior. The patents and licensing people use a number of databases. Their comments are that all are good, but not one of them is perfect.

In the ongoing business category, I will just cover the competitive analysis people. It is incredible what they glean from networking, briefing and debriefing du Pont travelers, perusing publications and using U.S. government agencies, which was a surprise to me. In fact, one particularly good person in this area mentioned that he calls the Department of Commerce of the Census Bureau two or three times per week. Also interesting, is that this competitive analyses person has never travelled personally to Japan!

So how does du Pont monitor and utilize information from Japan? By using personal networks and databases, backed up by formal information systems. For companies such as ours, it is probably far more important that a database be complete, rather than timely, because we use it to back up an informal, international network. Personal contacts are a key to initiating a search for new technical information from Japan.

FIGURE 1

"TODAY"

WHO NEEDS TECHNICAL INFORMATION?

- RESEARCHER
- NEW BUSINESS DEVELOPMENT
- PATENTS AND LICENSING
- ONGOING BUSINESSES
    - COMPETITIVE ANALYSIS
    - MARKET DEVELOPMENT
    - RECRUITING & HIRING
    - CAPACITY EXPANSION

FIGURE 2

DUPONT INVOLVEMENT WITH JAPAN

IN JAPAN

- SENIOR VICE PRESIDENT - ELECTRONICS
- BUSINESSES, JOINT VENTURES, & R&D
  - AUTOMOTIVE PAINT
  - FIBERS
  - IMAGING SYSTEMS
  - AGRICULTURAL PRODUCTS
  - POLYMERS
- RESEARCHER EXCHANGES & VISITS
  - SONY
  - MATSUSHITA
  - TOKYO UNIVERSITY
  - KYOTO UNIVERSITY
- GRANTS TO EDUCATION
- CONSORTIA MEMBERSHIP
  - ISTEC, RESIDENT SCIENTIST
- JAPANESE SUPPLIERS
  - KAO, TAKEMOTO O&F, UBE, MITSUBISHI KASEI
- CONFERENCES
  - MT FUJI FIBERS CONFERENCE
  - IUPAC CHEMRAWN - KOBE
  - HYONGO ADVANCED POLYMERS - KOBE
  - PACIFIC POLYMER CONFERENCE - OTSU
  - JAPAN FINE CERAMICS
  - POLYMER CHEMISTRY SOC OF JAPAN
- TECHNOLOGY TRANSFER TRIPS

FIGURE 3

DUPONT INVOLVEMENT WITH JAPAN

IN THE U.S.

- RESEARCH EXCHANGES & VISITS
  - CUSTOMERS
  - UNIVERSITY FACULTY & POST-DOCS
  - JOINT VENTURE EMPLOYEES
  - SEMINAR PROGRAMS

- LANGUAGE TRAINING & TRANSLATIONS
  - SCIENTIST TRAINING
  - LANGUAGE PROFESSIONALS
  - JAPANESE RESEARCHERS

- EMAIL

- INFORMATION SOURCES
  - PUBLICATIONS
    - Primary Literature
    - News Media
  - DATABASES
    - Patent
    - Dialog
  - STUDIES
    - Multi-client
    - Contract Studies & Services

FIGURE 4

HOW IT WORKS

- NO CENTRALIZED GENERAL MONITORING
- INDIVIDUAL INITIATIVE
- CORPORATE INFORMATION SCIENCE, BUSINESS INFORMATION CENTER
- RESEARCHERS
  - ABSTRACTS IN ENGLISH
  - CONFERENCE ATTENDANCE AND REPORTS
  - NEWSLETTERS
  - EMAIL NETWORKING
  - PATENT AWARENESS
- NEW BUSINESS DEVELOPMENT
  - TRAVEL TO JAPAN
  - MULTI-CLIENT STUDIES
  - PERSONAL NETWORKS
  - INDIVIDUAL PROFILE SERVICES
- PATENTS & LICENSING
  - DATABASES
    - Numerous, but none "perfect"

FIGURE 5

HOW IT WORKS

ONGOING BUSINESSES

- COMPETITIVE ANALYSIS
    - EMAIL NETWORK
    - DEBRIEFING TRAVELERS
    - TRADE JOURNALS
    - CLIPPING SERVICES
    - DEPARTMENT OF COMMERCE
    - CENSUS BUREAU
    - CONTRACTED STUDIES
- MARKET DEVELOPMENT
    - TRADE PUBLICATIONS
    - TRADE SHOWS & CONFERENCES
    - CONTRACTED CONSULTANTS
    - DIRECTORIES
- RECRUITING & HIRING
    - NETWORKS
    - PERSONAL VISITS
- CAPACITY EXPANSIONS
    - VENDORS
    - PERSONAL VISITS
    - TRADE PUBLICATIONS & CONFERENCES

The Relationship Between Technology Policy and Scientific and Technical Information within the U.S. and Japanese Aerospace Industries

Dr. Thomas E. Pinelli, NASA Langley Research Center, Ms. Rebecca O. Barclay, Rensselaer Polytechnic Institute, Mr. Tom Lahr, Scientific and Technical Information Program, NASA, and Mr. Glenn Hoetker, Scientific and Technical Information Program, NASA

With its contribution to trade, its coupling with national security, and its symbolism of technological strength, the aerospace industry occupies a unique position in the industrial structures of the United States and Japan and plays critical but different roles in the economies of both nations. In the U.S. and Japan, government policy has influenced innovation in the aerospace industry, particularly in the commercial aviation sector, with its demand for military and civilian aircraft and through direct support of research. In both nations, government has played a major role in the production, transfer, and use of scientific and technical information (STI) resulting from aerospace research and development (R&D). This paper focuses on the aerospace industry in the U.S and Japan and the role of STI in the process of aerospace innovation. It calls for a coordinated set of technology policy goals and an active STI diffusion-oriented system that scans, acquires, and transfers foreign STI for domestic users.

U.S. Aerospace in Perspective

The U.S. government has a long history of providing national leadership and significant financial support for the development of aerospace research and technology (R&T). In fact, the U.S. aerospace industry, in particular the commercial aviation sector, is unique among manufacturing industries in that a government research organization, the National Advisory Committee for Aeronautics (NACA), subsequently the National Aeronautics and Space Administration (NASA), has for many years conducted and funded research on airframe and propulsion technologies. The commercial aviation sector has also benefited from considerable investment in terms of research and procurement by the Department of Defense. “Although not intended to support innovation in any but military airframe and propulsion technologies, this investment has, nonetheless, yielded indirect, but very important, technological spillovers to the commercial aircraft industry” (Mowery, 1985, p. 17). A critical element of the U.S. economy, the U.S. aerospace industry is a national and global leader. Aerospace produces the largest trade surplus of any U.S. industry ($26 billion in 1990), which significantly reduces the nation's merchandise trade deficit (U.S. Department of Commerce, 1991, p. 25-1).

U.S. aerospace policy assumes a positive relationship between U.S. preeminence in both military and civil aviation and effective U.S. aerospace R&T programs. In 1982, the Keyworth study was undertaken to examine the appropriateness and effectiveness of U.S. aeronautical R&T policies and the U.S. government’s role in support of aeronautical R&T. The study concluded that superiority in aeronautics is a unique and vital asset to U.S. national security and that U.S. aeronautical R&T is a clearly established government responsibility. The study also concluded

that unclassified but critical dual-use technology was not being adequately controlled and that the results of non-U.S. aeronautical R&T were not being purposefully collected and diffused within U.S. government and industry (Office of Science and Technology Policy, 1982).

Japanese Aerospace in Perspective

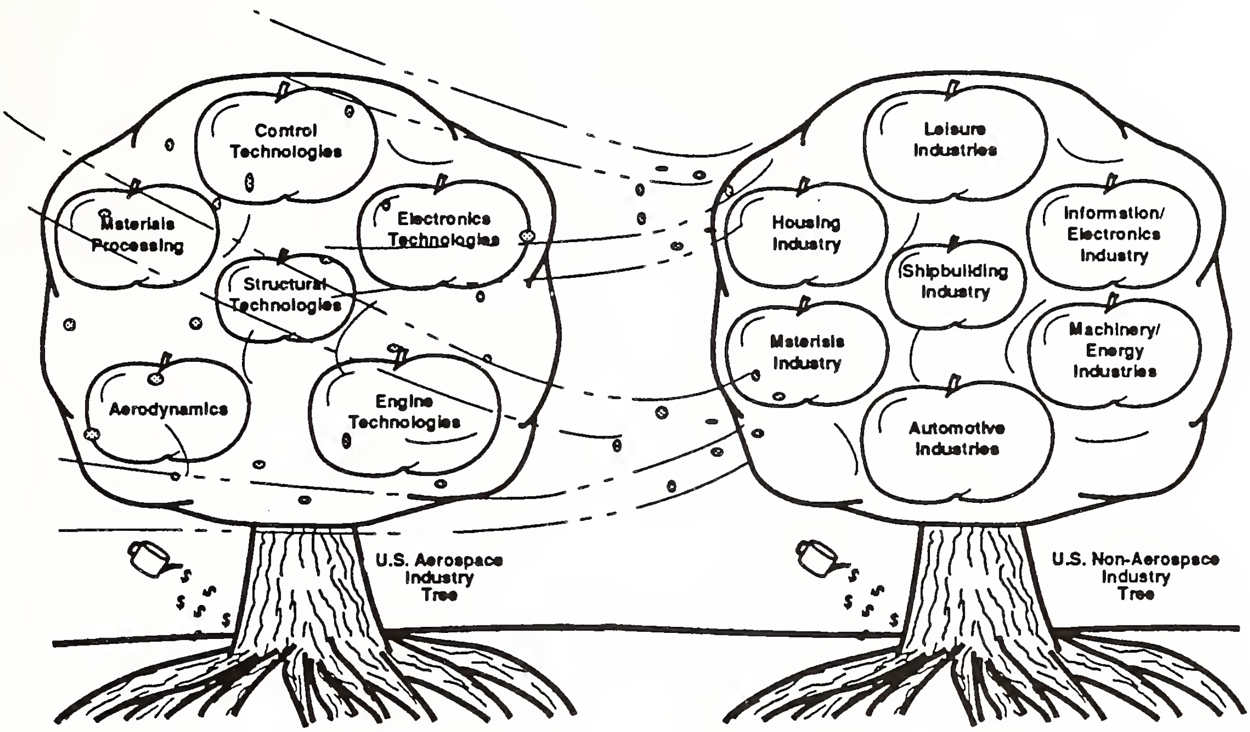
In Japan, aerospace enjoys considerable public support because of its technological linkages with a wide range of high-value-added industries. Japanese industry and government have targeted aerospace as one of three key technologies for the next century. Japan's initial effort to develop an indigenous aerospace industry suffered losses "four times its capitalization and when it wound down in the early 1970s, the planners retreated from their independent approach to consider less ambitious strategies for commercial aviation" (Samuels and Whipple, 1989, p. 277-8). Government and industry subsequently allied themselves as junior partners with leading Western aerospace producers, and Japanese subsidies for commercial jet engine development soon equaled those for computer research and exceeded those for energy and telecommunications. By 1990, the Japanese Ministry of International Trade and Industry (MITI) had actively supported a decade of commercial collaboration with Western aerospace firms in an attempt to transform commercial aerospace into the next Japanese export success story (Samuels and Whipple, 1989, p. 275). As with other industries, Japan has emphasized the acquisition, development, and use of aerospace technology to improve its national economic performance. The Japanese aerospace industry has excelled in adapting foreign technology and expertise in contrast to the "not-invented-here" (NIH) syndrome found in the United States.

Policy Considerations

Can government involvement in the aerospace industry serve as a useful model for stimulating non-defense technological innovation? It is generally accepted that investing in national security should result in products and processes having commercial application. Engineers and scientists outside of the defense community would learn of these discoveries and would adopt them to produce marketable goods. However, few technologies proceed effortlessly from defense conception to commercial application. The technology process requires substantial additional investment and attention (Alic et al., 1992, p. 9). Frequently, programs for technology transfer ignore (1) the relationship between knowledge production, transfer, and utilization as equally important components of the innovation process, and (2) the limitations of organizations engaged in technological innovation to exploit extramural research. Both U.S. and Japanese policies in the aerospace industries have not only supported precommercial research in military and civilian aircraft technologies, but they have also played a major role in supporting the diffusion of the results of such research.

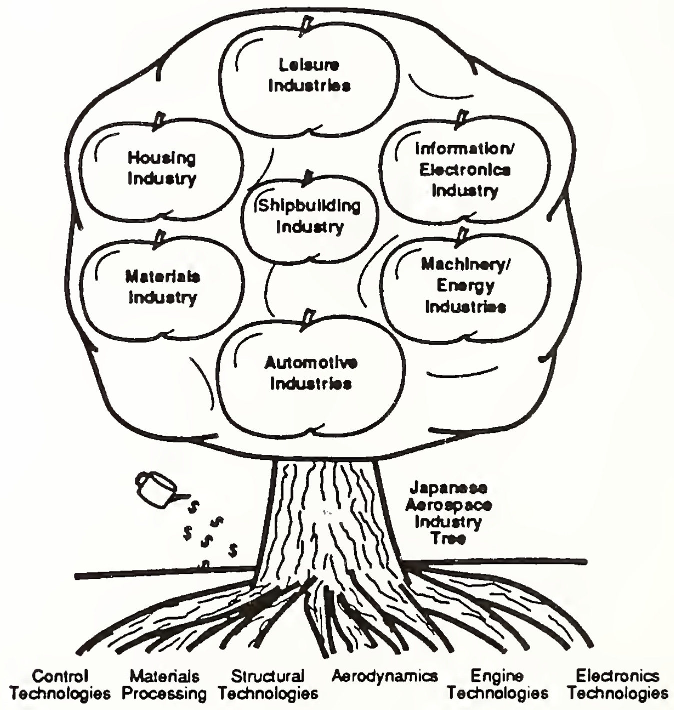
These policies exhibit a fundamental difference, however. U.S. government programs encourag the utilization of knowledge only after the R&D results have been generated rather than durin the idea development phase of the innovation process (Roberts and Frohman, 1978, p. 9). Th concept of "spin off" is illustrated in figure 1. Spin-off emphasizes revolutionary developmen that create new markets, rather than the processes of incremental improvements and rap response on which commercial competitiveness demands. The spin-off paradigm portray knowledge diffusion as easy and nearly automatic; it assumes that borrowers can recognize an apply potentially useful technology from government funded R&D and apply it with minim effort to any number of non-defense industries (Alic, et al., 1992, p. 9).

Figure 1. U.S. Technology Spin-Off Model



Japanese government programs, in contrast, do not wait until the R&D results have been generated. Technology transfer programs in Japan, as illustrated in figure 2, "spin on" or extend the application of technologies originally developed for commercial purposes (Samuels and Whipple, 1989, p. 276). Technological development is valued for its ability to elevate the fundamental capacities of the economy. Consequently, the know-how that enabled production in a particular technology is "diffused aggressively throughout the Japanese economy" (Friedman and Samuels, 1992, p. 4). This know-how is obtained by acquiring foreign STI through licensing, joint ventures, and direct purchase of foreign high technology companies. Although Japan's private sector conducts most technology acquisition activities, the Japanese government actively encourages and facilitates the transfer of STI (Chaney and Grimes, 1991, p. 3).

Figure 2. Japanese Technology Spin-On Model



MODELS FOR THE TRANSFER OF STI

Three models or approaches have dominated the "transfer" of STI arising from government funded R&D (Ballard, et al., 1989; Williams and Gibson, 1990). While variations of the models or approaches have been tried in a number of disciplines, a "supply-side" dissemination model is used to transfer aerospace STI in the U.S. and, to a lesser extent, in Japan.

The Appropriability Model

The **appropriability model** emphasizes the production of government-funded knowledge that would not otherwise be produced by the private sector and competitive market pressures to promote the use of that knowledge. This model emphasizes the production of basic research as the driving force behind technological development and economic growth, and assumes that government funded R&D will be rapidly assimilated by the private sector. Deliberate transfer mechanisms and intervention by information intermediaries are viewed as unnecessary. Appropriability emphasizes the supply (production) of knowledge in sufficient quantity to attract potential users. Good technologies, according to this model, sell themselves and offer clear policy recommendations regarding government priorities for improving technological development and economic growth. This model incorrectly assumes that the results of government funded R&D will be acquired and used by the private sector, ignores the fact that most basic research is irrelevant to technological innovation, and dismisses the process of technological innovation within the firm.

The Dissemination Model

The **dissemination model** emphasizes the need to transfer information to potential users and embraces the belief that the production of government funded knowledge is not sufficient to ensure its fullest use. Linkage mechanisms, such as information intermediaries, are needed to identify useful knowledge and to transfer it to potential users. This model assumes that if these mechanisms are available to link potential users with knowledge producers, then better opportunities exist for users to determine what knowledge is available, acquire it, and apply it to their needs. The strength of this model rests with the recognition that STI transfer and use are critical elements of the process of technological innovation. Its weakness lies with the fact that it is passive, for it does not take users into consideration except when they enter the system and request assistance; however, user requirements are seldom known or considered in the design of information products and services. This model employs one-way, source-to-user transfer procedures that are seldom responsive in the user context. In this model, the role of information technology is expanded to emphasize information and retrieval, but retrieval is accomplished by intermediaries who are required to have more familiarity with the activities of the knowledge producers than the potential users have.

The Knowledge Diffusion Model

The **knowledge diffusion model** is grounded in theory and practice associated with the diffusion of innovation and planned change research, and the clinical models of social research and mental health. Knowledge diffusion emphasizes "active" intervention as opposed to dissemination and access; stresses intervention and reliance on interpersonal communications as a means of identifying and removing interpersonal barriers between users and producers; and assumes that knowledge production, transfer, and use are equally important components of the R&D process. This approach also emphasizes the link between producers, transfer agents, and users and seeks to develop user-oriented mechanisms (e.g., products and services) specifically tailored to the needs and circumstances of the user. It makes the assumption that the results of government funded R&D will be under utilized unless they are relevant to users and ongoing relationships are developed among users and producers. This model uses proactive information intermediaries and information technology to enhance both formal and informal communication among all participants in the innovation process. It purposefully collects, analyzes, and diffuses foreign STI. It encourages the user oriented development and evaluation of STI products and services.

The STI Aerospace Dissemination Model: An Analysis and Critique

As we envision it, the Aerospace STI Dissemination Model is composed of two parts -- the **informal** that relies on collegial contacts and the **formal** that relies on surrogates, information products, and information intermediaries to complete the "producer to user" transfer process. Producers include government laboratories, the aerospace industry, and universities. (The more collegial the relationships between government laboratories, the aerospace industry, and universities, the greater the effectiveness of the STI Aerospace Dissemination Model.) Surrogates serve as repositories or clearinghouses for the producers. In the U.S. they include the Defense Technical Information Center (DTIC), the NASA Center for Aero Space Information (CASI), and the National Technical Information Service (NTIS). In Japan they include the Japan Information Center of Science and Technology (JICST), the National Center for Science Information System (NACSIS), and to a lesser extent, the National Space Development Agency which operates the Aerospace Information Reference System (AIRS).

Intermediaries are, in large part, librarians and technical information specialists in academia, government, and industry. Those representing the producers serve as what McGowan and Loveless (1981) call "knowledge brokers" or "linking agents." Information intermediaries connected with users act, according to Allen (1977), as "technological entrepreneurs" or "gatekeepers." The more "active" the intermediary, the more effective the transfer process (Goldhor and Lund, 1983). Active intermediaries take information from one place and move it

to another, often face-to-face. Passive information intermediaries, on the other hand, "simply array information for the taking, relying on the initiative of the user to request or search out the information that may be needed" (Eveland, 1987, p. 4).

The major problem with the STI Aerospace Dissemination Model is that it lacks a "coherent or systematically designed approach to transferring the results of R&D to the user" (Ballard, et al., 1986, p. 2-3). Approaches to STI transfer may vary considerably and may change significantly over time. These variations reflect fundamental differences between organizations (e.g, government and industry), the interpretation of their missions, and budgetary opportunities and constraints. For example, in their study of issues and options in U.S. government STI policy, Bikson and her colleagues found that many interviewees considered dissemination activities "afterthoughts, undertaken without serious commitment by agencies whose primary concerns were with [knowledge] production and not with knowledge transfer;" therefore, "much of what has been learned about knowledge transfer has not been incorporated into [formal] STI transfer activities" (Bikson, Quint, and Johnson, 1984, p. 22).

The specific problem with the **informal** part of STI Aerospace Dissemination Model is that knowledge users can learn from collegial contacts only what those contacts happen to know. Ample evidence supports the claim that no one researcher can know about or keep up with all the research in his/her area(s) of interest. Two problems exist with the **formal** part of the model. It employs one-way, source-to-user transmission, but one-way, "supply-side" transfer procedures do not seem to be responsive to the user context (Bikson, Quint, and Johnson, 1984). Rather, these efforts appear to start with an information system into which the users' requirements are retrofit (Adam, 1975). The consensus of the findings from the empirical research is that interactive, two-way communications are required for effective information transfer. (Bikson, Quint, and Johnson, 1984).

The **formal** part of the model also relies heavily on information intermediaries to complete the knowledge transfer process, but a strong methodological base for measuring or assessing the effectiveness of the information intermediary is lacking (Kitchen and Associates, 1989). The impact of information intermediaries is likely to be strongly conditional and limited to a specific institutional context. To date, empirical findings on the effectiveness of information intermediaries and the role(s) they play in knowledge transfer are sparse and inconclusive (Beyer and Trice, 1982).

The **formal** part of the STI Aerospace Dissemination Model is ineffective because aerospace STI is not organized and structured according to problem relevance. More to the point, putting aerospace STI to use frequently requires transferring it in a use context that is quite different from the context in which it was produced or originally packaged. This problem is complicated by the fact that aerospace STI is organized along traditional disciplinary lines as are subject matter indexes, abstracts, and key words. This organizational scheme makes multidisciplinary

retrieval extremely difficult for users and (typically non-technical) information intermediaries alike. The **formal** part of the model becomes even less effective when the user's environment is not well aligned with the standard disciplinary taxonomies (Bikson, Quint, and Johnson, 1984).

THE INFORMATION-SEEKING BEHAVIOR OF JAPANESE AND U.S. AEROSPACE ENGINEERS AND SCIENTISTS

Rapidly changing patterns of international cooperation and collaboration and innovative technological and managerial changes are combining to influence the production, transfer, and use of STI in the workplace. To contribute to our understanding of information-seeking behavior at the international level, an exploratory study was conducted that investigated the information-seeking behavior of aerospace engineers and scientists in Japan and the United States.

The data reported herein were collected through self-administered questionnaires undertaken as a Phase 4 activity of the *NASA/DoD Aerospace Knowledge Diffusion Research Project.* The Japanese-U.S. study included the following objectives:

1. To solicit the opinions of aerospace engineers and scientists regarding the importance to their profession of effectively communicating STI;

2. To determine the types of STI products produced and used by aerospace engineers and scientists;

3. To determine the use and importance of computer and information technology to them; and

4. To determine the sources of STI used in problem solving.

Background

Aerospace engineering exhibits particular characteristics which make it an excellent platform for studying information-seeking behavior in the international workplace. The aerospace industry is becoming more international in scope and increasingly collaborative in nature, thus creating a multinational manufacturing environment. International industrial alliances will result in a more rapid diffusion of technology in order to enhance innovation and increase productivity. Aerospace producers will feel growing pressure to push forward with new technological developments, to maximize the inclusion of those developments into the R&D process, and to maintain and improve the professional competency of aerospace engineers and scientists. Meeting these objectives at a reasonable cost depends on a variety of factors, but largely on the ability of aerospace engineers and scientists to acquire, process, and communicate STI. Studies have shown that access to STI can increase productivity and innovation and help aerospace

engineers and scientists maintain and improve their professional skills. These same studies demonstrate, however, that little is known about how aerospace engineers and scientists find and use STI or how aerospace knowledge is diffused. To learn more about this process, researchers at the NASA Langley Research Center, the Indiana University Center for Survey Research, Rensselaer Polytechnic Institute, and institutions in selected countries are studying aerospace knowledge diffusion. These studies comprise the *NASA/DoD Aerospace Knowledge Diffusion Research Project.*

Phase 1 of the project investigates the information-seeking behavior of U.S. aerospace engineers and scientists and places particular emphasis on their use of federally funded aerospace R&D and U.S. government technical reports. Phase 2 examines the industry-government interface and emphasizes the role of information intermediaries in the aerospace knowledge diffusion process. Phase 3 concerns the academic-government interface and focuses on the relationships between and among the information intermediary, faculty, and students. Phase 4 explores patterns of technical communications among non-U.S. aerospace engineers and scientists in selected countries (Pinelli, Kennedy, and Barclay, 1991). A list of *NASA/DoD Aerospace Knowledge Diffusion Research Project* publications appears in the Appendix.

The Japanese exploratory study is particularly interesting for two reasons. First, Japanese culture is perhaps as different from that of the U.S. as the culture of any other developed nation; hence, it has the potential to provide us with instructive contrasts and insights into the influence of language and culture on information-seeking behavior. Second, very few studies specifically concerned with the information-seeking behavior of Japanese engineers and scientists have been conducted. The bulk of the literature on Japanese information-seeking focuses on interpersonal and business communication rather than on the communication of STI. (For a discussion of the importance of language and culture on STI in Japan, see Kohl et al., 1993.)

Research Design and Methodology

A list of approximately 50 U.S. and 13 Japanese aerospace engineers and scientists served as the sample frame for the exploratory study. All of these engineers and scientists were working in the fields of cryogenics, magnetic suspension, and adaptive walls. We sent multiple questionnaires to the members of the sample and asked that each recipient distribute the survey to colleagues. We received 63 U.S. and 96 Japanese responses by the established cut off date.

Demographic Information About the Survey Respondents

Survey respondents were asked to provide information regarding their professional duties, organizational affiliation, years of professional work experience, education, gender, and whether English was their first (native) language. These demographic findings appear in table 1.

Table 1. Demographic Findings
[N=96;N=63]

	Japanese		U.S.	
	%	(n)	%	(n)
Professional Duties				
Design/development	27	(26)	14	(9)
Administration/management	2	(2)	27	(17)
Research	40	(38)	35	(22)
Other	31	(30)	24	(15)
Organizational Affiliation				
Academic	36	(34)	24	(15)
Government	26	(25)	41	(26)
Industry	37	(35)	24	(15)
Other	1	(1)	11	(7)
Professional Work Experience				
1 - 9 years	26	(25)	8	(8)
10 - 19 years	35	(34)	15	(9)
20 or more years	39	(37)	39	(48)
Education				
Bachelor's degree or less	22	(21)	18	(11)
Graduate degree	78	(74)	82	(52)
Educational Preparation				
Engineer	91	(87)	87	(55)
Scientist	8	(8)	13	(8)
Other	1	(1)	0	(0)
Current Duties				
Engineer	91	(87)	68	(42)
Scientist	6	(6)	10	(6)
Other	3	(3)	22	(14)
English (native) language	0	(100)	89	(55)
Member of a Professional/ Technical Society	87	(83)	87	(56)
Gender	1	(1)	2	(1)
Female	99	(95)	98	(62)
Male				

A comparison of the two groups reveals that they are similar in education, educational preparation, and gender. They differ in professional duties, organizational affiliation, years of professional work experience, and current duties. We speculate that differences in organizational affiliation and professional duties may account for some variations in the responses of the two groups. However, we took these differences into account in our analysis of the data and in the discussion which follows.

Importance of and Time Spent Communicating STI

Approximately 97 percent of the Japanese respondents and 95 percent of the U.S. respondents indicated the ability to communicate STI effectively is important. (Importance was measured on a 5-point scale with a 1 = very unimportant and 5 = very important; percentages = combined "4" and "5" responses. According to Hall (1976), Japan (unlike the U.S.) is a high-context society, in which information is widely and freely shared. Even the typical Japanese office arrangement, in which dozens of workers share a common workspace, with desks arranged in groups and separated only by low dividers (Haas and Funk, 1989, p. 364), would seem to encourage communication. Hence we might expect Japanese aerospace engineers and scientists to spend more time communicating STI than their American counterparts.

However, when subjects were asked how many hours per week they spend communicating STI, the median for Japanese respondents was 5 hours, compared to 10 hours for the Americans. (table 2.) We believe the explanation for this apparent contradiction to be that the Japanese rely more on oral communication than on written communication. Because it takes less time to communicate orally than in writing, it is not surprising that the mean for the Japanese was lower.

The claim that the Japanese rely more on oral communication and less on written communication than Americans do is supported by several sources.

Table 2. Median Number of Hours Spent Each Week by Japanese and U.S. Aerospace Engineers and Scientists Communicating Scientific and Technical Information

	Japanese	U.S.
Communicating With Others	5.00 hours/week	10.00 hours/week
Working With Communications Received From Others	10.00 hours/week	10.00 hours/week
Percent of Work Week Devoted to Technical Communications*	37.5%	50%

* Based on a 40-hour work week

For example, in their ethnographic study of Japanese technical communication, Haas and Funk (1989) found that "shared information is primarily spoken rather than written." They also noted "work groups met formally as often as twice a day," and that "matters of office procedure, upcoming deadlines, even notices of social events, which might be conveyed in memos in the U.S. were announced publicly at departmental meetings" (pp. 364-365). Similarly, Cutler (1988) observes that "it is difficult to track research activities in Japan because there are no paper trails, no intermediate publication points" (p. 45).

Approximately 38 percent of the Japanese respondents and 42 percent of the U.S. respondent indicated that the amount of time they spent communicating STI had increased over the past 5 years (table 3). Forty-seven percent of the Japanese respondents and 45 percent of the U.S respondents indicated that the amount of time they spent communicating STI had stayed the same over the past 5 years. Fifteen percent of the Japanese respondents and 13 percent of th U.S. respondents indicated that the amount of time they spent communicating STI had decreased over the past 5 years.

Table 3. Changes in the Past 5 Years in the Amount of Time Spent Communicating Scientific and Technical Information by Japanese and U.S. Aerospace Engineers and Scientists

	Japan		U.S.	
	%	(n)	%	(n)
Increased	38	(36)	42	(26)
Stayed the Same	47	(45)	45	(28)
Decreased	15	(15)	13	(8)

As they have advanced professionally, 48 percent of the Japanese respondents have increased the amount of time they spend communicating STI. Likewise, 56 percent of the U.S. respondents indicated that, as they have advanced professionally, they have increased the amount of time they spend communicating STI (table 4).

Table 4. Changes in the Amount of Time Spent Communicating Scientific and Technical Information as a Part of Professional Advancement by Japanese and U.S. Aerospace Engineers and Scientists

	Japan		U.S.	
	%	(n)	%	(n)
Increased	48	(46)	56	(35)
Stayed the Same	34	(32)	25	(16)
Decreased	18	(17)	19	(12)

Scientific and Technical Information Products Produced

When survey participants were asked how many times they wrote or prepared various types of STI products, their responses further confirmed the Japanese emphasis on oral communication. For example, the Japanese respondents produce far fewer memos (the most common form of internal written communication) than their American counterparts (table 5). As Funk (1988) observed, in Japan "projects...are set up quickly, without paperwork or written requisitions. Employees from one department frequently visit other departments in order to coordinate their activities" (p. 58).

Table 5 also shows that the Japanese produce fewer letters, audiovisual materials, and technical talks/presentations than the U.S. respondents. They produce more of certain scholarly or research-based types of publications such as abstracts, in-house technical reports, and journal articles, and they write the same number of conference/meeting papers and technical proposals as their U.S. counterparts. However, these latter types of documents are written less frequently than the others, and the low numbers that are involved make these median figures less meaningful. Thus, although the Japanese do not use written communication at least as often as U.S. aerospace engineers and scientists do to document and report their research, it seems clear that they rely on informal oral communication for many kinds of information that are communicated in writing in the U.S.

Scientific and Technical Information Products Used

We also asked subjects how many hours per week they spend working with STI received from others. For this question, the medians for the Japanese and the Americans were the same: 10 hours per week (Table 2). However, when asked about how many times they had used particular types of STI during the past six months, the Japanese reported using far fewer memos, letters, and audiovisual materials, but more abstracts, conference/meeting papers, journal articles, technical manuals, computer program documentation, drawings/specifications, and AGARD (Advisory Group for Aerospace Research and Development) reports (Table 6).

Table 5. Median Number of STI Products Produced in the Past Six Months by Japanese and U.S. Aerospace Engineers and Scientists

	Japan	U.S.
Letters	5	10
Memos	1	6
Audiovisual Materials	0	4
Technical Talks/Presentations	2	3
Conference/Meeting Papers	1	1
Technical Proposals	1	1
Abstracts	2	1
In-house Technical Reports	2	1
Journal Articles	1	0
Drawings/Specifications	0	0
AGARD Technical Reports	0	0
Computer Program Documentation	0	0
Technical Manuals	0	0
Trade/Promotional Literature	0	0
U.S. Government Technical Reports	0	0

Because the different subgroups of the survey participants undoubtedly use and produce different types of STI in varying quantities and proportions, we also analyzed the responses of the university professors, administrators, and R&D engineers separately. Although the specific U.S.-Japanese ratios varied slightly, the pattern was consistent: the Japanese are able to spend more time producing and working with STI that is the most essential to research, and they "have much less work-related 'mail' to sort through every day than their American counterparts" (Haas and Funk 1989, p. 365). We suspect that the two phenomena are related.

Use and Importance of Computer and Information Technology

Survey participants were asked about their use of computer technology to prepare STI. About 86 percent of the Japanese respondents use computer technology to prepare STI. Almost all (98 percent) of the U.S. respondents use computer technology to prepare STI. About 24 percent of the Japanese respondents and about 37 percent of the U.S. respondents "always" use computer technology to prepare STI. A majority of both groups (99 percent and 98 percent) indicated that computer technology had increased their ability to communicate STI. About 52 percent of the Japanese respondents and 69 percent of the U.S. respondents stated that computer technology had increased their ability to communicate STI "a lot."

Table 6. Median Number of STI Products Used in the Past
Six Months by Japanese and U.S. Aerospace Engineers and Scientists

	Japan	U.S.
Letters	5	10
Memos	1	10
Trade/Promotional Literature	2	4
Technical Proposals	2	3
Audiovisual Materials	2	5
U.S. Government Technical Reports	2	5
Technical Talks/Presentations	5	8
Journal Articles	6	6
Technical Manuals	2	2
In-house Technical Reports	6	5
Abstracts	10	6
Conference/Meeting Papers	10	7
Drawings/Specifications	5	3
AGARD Technical Reports	3	2
Computer Program Documentation	5	2

From a prepared list, survey respondents were asked to indicate which computer software they used to prepare written STI (Table 7). Word processing software was used most frequently by both groups. Overall, the U.S. respondents made greater use of computer software for preparing written technical communications than did their Japanese counterparts; however, the Japanese respondents made greater use of word processing software than did their U.S. counterparts.

Table 7. Use of Computer Software by Japanese and U.S. Aerospace Engineers and Scientists to Communicate Written Scientific and Technical Communications

Software	Japanese		U.S.	
	%	(n)	%	(n)
Word Processing	99	(90)	95	(55)
Outliners and Prompters	9	(7)	14	(7)
Grammar and Style Checkers	24	(20)	26	(14)
Spelling Checkers	62	(53)	74	(42)
Thesaurus	13	(11)	37	(20)
Business Graphics	28	(24)	31	(16)
Scientific Graphics	63	(56)	79	(45)
Desktop Publishing	28	(24)	30	(16)

Survey respondents were also given a list of information technologies and were asked, "How do you view your use of the following information technologies in communicating STI?" Their choices included "already use it"; "don't use it, but may in the future"; and "don't use it and doubt if I will." The Japanese and U.S. aerospace engineers and scientists who participated in this study use a variety of information technologies. The percentages of "I already use it" responses ranged from a high of 88 percent (FAX/TELEX) to a low of 5 percent (teleconferencing) for Japanese respondents. Similarly, the U.S. responses ranged from a high of 97 percent (FAX or TELEX) to a low of 5 percent (laser disk/video disk/CD-ROM).

Table 8. Use, Nonuse, and Potential Use of Information Technologies by Japanese and U.S. Aerospace Engineers and Scientists

Information Technologies	Already Use It		Don't Use It, But May in Future		Don't Use It and Doubt If Will	
	Japan %	U.S. %	Japan %	U.S. %	Japan %	U.S. %
Audio Tapes and Cassettes	28	24	43	37	29	40
Motion Picture Film	21	30	43	23	36	47
Videotape	74	56	25	34	1	10
Desktop/Electronic Publishing	27	32	64	52	9	17
Computer Cassettes/Cartridge Tapes	26	32	37	35	37	33
Electronic Mail	33	54	59	30	8	16
Electronic Bulletin Boards	22	16	66	54	12	30
FAX or TELEX	88	97	9	2	3	1
Electronic Data Bases	42	39	55	53	3	8
Video Conferencing	5	23	67	60	28	17
Teleconferencing	5	54	50	39	46	7
Micrographics and Microforms	57	22	31	43	12	35
Laser Disk/Video Disk/CD-ROM	17	5	80	75	3	20
Electronic Networks	36	38	60	44	4	18

A list, in descending order, follows of the information technologies most frequently used.

Japanese

FAX or TELEX	88%
Videotape	74%
Micrographics and Microfilm	57%
Electronic Data Bases	42%
Electronic Networks	36%

U.S.

FAX or TELEX	97%
Videotape	56%
*Electronic Mail	54%
*Teleconferencing	54%
Electronic Data Bases	39%
Electronic Networks	38%

* indicates tie

A list, in descending order, follows of the information technologies "that are not currently being used but may be used in the future."

Japanese		U.S.	
Laser Disk/Video Disk/ CD-ROM	80%	Laser Disk/Video Disk/ CD-ROM	75%
Videoconferencing	67%	Videoconferencing	60%
Electronic Bulletin Boards	66%	Electronic Bulletin Boards	54%
Desktop/Electronic Publishing	64%	Electronic Data Bases	53%
Electronic Networks	60%	Desktop/Electronic Publishing	52%

Use of STI in Problem Solving

From a list of sources of STI, survey respondents were asked to indicate which sources they routinely used in problem-solving (table 9).

Table 9. Sources of STI Used by Japanese and U.S. Aerospace Engineers and Scientists in Problem-Solving

	Japanese		U.S.	
	%	(n)	%	(n)
Informal Discussions With Colleagues	98	(93)	100	(61)
Discussions With Supervisors	73	(68)	66	(38)
Discussions With Experts In Organization	89	(84)	100	(62)
Discussions With Experts Outside Organization	70	(66)	89	(54)
U.S. Government Technical Reports	47	(44)	90	(54)
Other Technical Reports	92	(86)	92	(56)
Professional Journals	96	(91)	90	(56)
Conference/Meeting Papers	72	(68)	95	(58)
Textbooks	93	(87)	92	(56)
Handbooks And Standards	82	(76)	64	(37)
On-line Sources Of STI	60	(54)	37	(21)
Librarians/Technical Information Specialists	21	(19)	86	(53)
Personal Store Of STI	79	(73)	95	(59)

Sources of STI used for problem-solving by Japanese and U.S. aerospace engineers and scientists in this survey exhibit a number of interesting similarities and differences. Both groups of respondents rely heavily on collegial (informal) sources of STI (discussions with others), which confirms the oral tradition of technology (as opposed to science) and, in the case of Japanese language traditions, reliance on the spoken word. Both groups also rely on formal and informal printed products (journal articles and technical reports). The Japanese respondents reported a greater use of on-line information (60 percent) than did the U.S. respondents (37 percent); however, they reported less frequent use of personal collections of STI (79 percent) than did their U.S. counterparts (95 percent). Only 21 percent of the Japanese respondents consulted a librarian or technical information specialist whereas 86 percent of the U.S. respondents consulted such an individual in the search for STI.

Discussion

Given the limited purposes of this exploratory study, the overall response rates, and the research designs, no claims are made regarding the extent to which the attributes of the respondents in the studies accurately reflect the attributes of the populations being studied. A much more rigorous research design and methodology would be needed before any claims could be made. Nevertheless, the findings of the studies do permit the formulation of the following general statements regarding the production, transfer, and use of STI by the aerospace engineers and scientists who participated in the two studies:

1. The ability to communicate STI effectively is important to Japanese and U.S. aerospace scientists and engineers.

2. As the Japanese and U.S. aerospace engineers and scientists in these studies have advanced professionally, the amount of time they spend producing and working with STI products has increased for more than one-third of the Japanese respondents (42 percent) and the U.S. respondents (38 percent).

3. The Japanese and U.S. aerospace engineers and scientists in these studies display great similarities in their reported use and anticipated use of information technology, particularly electronic-network-related technologies.

4. Both the Japanese and U.S. aerospace engineers and scientists in these studies make use of oral sources of STI within and outside their organizations. The Japanese respondents do not appear to rely on librarians and technical information specialists to the extent that their U.S. counterparts do; however, they do make greater use of on-line sources of STI than do their U.S. counterparts.

Despite the limitations of this investigation, these findings contribute to our knowledge and understanding of the production, transfer, and use of STI by aerospace engineers and scientists at the national and international levels. The findings reinforce some of the conventional wisdom regarding the nature and importance of STI and the amount of time engineers and scientists devote to its production, transfer, and use. The findings hold implications for technology and STI policy development and point out a need for additional research.

U.S. TECHNOLOGY POLICY AND THE DIFFUSION OF STI

Critics, such as Tornatsky and Fleischer (1990) suggest that the "United States has no coherent innovation or technology policy. The United States does, however, have many programs and numerous policies which cut across political jurisdictions and the idiosyncratic missions and mandates of single agencies which are more or less responsive to a series of shifting political alliances and imperatives"(p. 241). Phillips (1992, p. 104) argues that existing national technology policy is vague, confusing, politicized, and frequently ineffective because it is usually driven by special interests rather than by strategic intent. With the globalization of technology, the continued loss by U.S. high technology industries of world market shares, and the end of the Cold War, political strategists and public policy planners are slowly beginning to conclude that the U.S. could benefit from a coherent, coordinated technology policy. George Fisher, CEO of Motorola, recently described the U.S.' primary rivals as no longer military ones. Fisher told a Chicago audience, " 'They are those who pursue economic, industry, and technology policies designed to expand their shares of global markets. U.S. policies [economic, trade, and technology] must reflect this reality if we are to remain a world leader and a role model' " (Phillips, 1992, p. 107). A review of U.S. and Japanese aerospace policy illustrate and reinforces Fisher's point.

U.S. and Japanese Aerospace Policy in Retrospect

Despite the expenditure of billions of dollars more on military and defense R&D in the U.S. than in Japan, Japanese manufacturers now exhibit defense production capabilities that match or exceed U.S. capabilities in many areas. This type of growth has occurred, Friedman and Samuels (1992) argue, because the Japanese view of technology and national security differs considerably from comparable American beliefs. In their paper, "How to Succeed Without Really Flying: The Japanese Aircraft Industry and Japan's Technology Ideology," Friedman and Samuels (1992, p. 3-5) make the following points.

- Both the U.S. and Japan have vigorously attempted to foster indigenous defense technologies but have employed very different ideologies and approaches to achieve this objective.

• U.S. technology strategy (policy) has focused on making public outlays to specialized defense laboratories and commercial firms and, while many "spin-offs" have occurred, no special effort has been made to marry commercial and defense industry capabilities. Indeed, U.S. strategy has actually impeded effective exchanges of commercial and defense technology.

• Japan, in contrast, has made little distinction between military and civilian technology, focusing instead on the following 3 principles: (1) obtaining and indigenzing foreign civilian and military design, development, and manufacturing capabilities; (2) diffusing these capabilities as widely as possible through the economy; and (3) nurturing and sustaining the prime and subcontractors to which commercial and military technologies could be diffused and from which indigenous development could be generated.

• To the Japanese, differences between domestic capabilities and foreign dependence were not as crucial as nurturing the more fundamental ability to design and make things. What matters most is aggressively diffusing the know-how that enables production throughout the Japanese economy as a matter of security (economic) ideology, national (technology) policy, and private practice. As part of the process, defense technology became valued as much for its ability to elevate the fundamental capacities of the economy as for its capability to produce military hardware.

• Unlike U.S. defense production, Japanese defense production is simply one of many technology linkages that firms maintain within the domestic economy. Japan's defense contractors are less specialized than their American counterparts and more readily combine defense and commercial production in a wider range of industrial undertakings. As a consequence, defense and commercial technologies interdiffuse -- they "spin-on" and "spin-off" to each other with comparative ease in Japan.

U.S. Technology Policy and STI

Although there is growing recognition that the U.S. should establish a consistent and coherent technology policy, there does not yet appear to be a political consensus as to its form and substance. In a recent trip to San Jose, California, President Clinton outlined his "supply-side" approach to technology policy which involves the use of tax breaks and "peace dividend" money from scaled-back defense spending to help create more high technology jobs. The key points of the President's policy include a permanent extension of the R&D tax credit, government support of new computer and communications technology, increased funding of the national (federal) laboratories, increased funding for the Environmental Protection Agency (EPA) for private-

industry development of environmental technology, and federal grants to industry-led research project among groups of companies, a tentative first step toward the kind of European government involvement that produced the Airbus ("Clinton Fleshes Out...", February 23, 1993, p. B9).

Implicit in Mr. Clinton's policy is the idea that U.S. technology policy should look like that of its chief competitors, namely Japan and Germany. Both of these countries have developed and implemented long-term strategic plans for economic competitiveness that benefit their companies (and their nation) in global competition. But those who urge that U.S. technology policy should look more like that of Japan and Germany overlook the profound reasons why the U.S. economic and political system differs so much from those of its economic competitors: (1) an individualistic, free-market culture that does not lend itself to national strategizing or statist planning and (2) what may be history's greatest collection of special interests, both in the financial capital of New York and the political capital of Washington, DC (Phillips, 1992, p. 110).

These differences notwithstanding, the call is becoming louder for an articulated U.S. technology policy that is based on competition in a global economy (Raloff, 1992; Burton, 1992; "Innovation: The Machinery..." and "American Technology Policy..."; and "Industrial Policy..."). A review of recent articles demonstrates the following points of agreement.

- The U.S. must develop and implement a coordinated and holistic approach to technological innovation and economic competitiveness.

- The current "supply-side" approach to technology policy, which is product, not process, oriented, encourages innovation and emphasizes the production of knowledge but not its transfer and use. [N.B., Mowery (1983) and others believe that the failure of previous U.S. attempts to stimulate non-defense R&D stems from the application of an inappropriate theoretical economic framework, one that ignores or does not account for the effective transmission and utilization of complex research results. In particular, attempts to transfer the results of "mission-agency" produced R&D overlook the ability and limitations of organizations engaged in non-defense R&D to exploit extramural research, thus ignoring the relationship between knowledge production, transfer, and utilization as equally important components of the innovation process.]

- The trickle-down benefits associated with the funding of basic research and mission-oriented (defense) R&D provide an inadequate basis for developing U.S. technology policy.

• In other words, the current approach will simply not restore the U.S. to a more competitive footing with its economic rivals who are adopting what Branscomb (1991) calls "diffusion-oriented" or "capability-enhancing" policies that increase the power to absorb and employ new technologies productively. Before U.S. technology policymakers can adopt such policies, however, they must discontinue relying on a rather passive, dissemination-oriented approach to the transfer of government-funded STI.

Policymakers generally agree that STI derived from government-funded R&D can be used to enhance technological innovation and economic competitiveness. Studies show a positive relationship between government funded STI and successful innovation, technical performance, and increased productivity. However, as Solomon and Tornatzky (1986) point out, "While STI, its transfer and utilization, is crucial to innovation [and competitiveness], linkages between [the] various sectors of the technology infrastructure are weak and/or poorly defined" (p.43). Defining and understanding these linkages is critical for formulating U.S. technology policy that would recognize the inherent relationship between technological innovation and STI resulting from government funded R&D. As Ballard, et al., (1986) have noted though, the U.S. lacks a coherent or systematically designed approach for transferring the results of government funded R&D to users.

Policy instruments such as the Stevenson-Wydler Technology Innovation Act of 1980 (P.L. 96-480), the Federal Technology Transfer Act of 1986 (P.L. 99-502), the Japanese Technical Literature Act of 1986 (P.L. 99-382), and Executive Order (E.O.) 12591, "Facilitating Access to Science and Technology" (April 10, 1987), the High Performance Computing Act of 1991 (P.L. 102-194), and Office of Management and Budget (OMB) Circular A-130 have shaped the legislative and regulatory environment for Federal STI policy. Excluding A-130, the intent of these instruments is to (1) develop a predominant position for the U.S. in international markets by facilitating technology transfer from government laboratories and (2) provide the inducements for Federal engineers and scientists to nurture the transfer process. In addition, some of these instruments provide a mechanism for the collection and dissemination of foreign (i.e., Japanese) STI in the U.S. The High Performance Computing Act, for example, emphasizes linking government, industry, and academia for distributed access to high-performance computing and communications (HPCC) although little emphasis is placed on the role of HPCC technologies in the transfer and utilization of government funded STI and technology transfer in general.

The intent of A-130, which concerns the management of information as a resource, includes Federal STI. According to OMB, STI conforms to a standard information life cycle and does not exhibit any unique characteristics calling for the development and implementation of a separate information policy framework. Attempts by OMB to regulate STI with a single policy instrument fail to recognize the linkages between Federal technology policy and federally funded STI; thus, from a policy standpoint, A-130 negates attempts by the Congress to promote innovation and competitiveness (Hernon and Pinelli, 1991).

The Globalization of Technology and STI

The past 20 years have witnessed the propensity of technology and STI to cross national boundaries, a phenomenon that observers such as Vernon (1987) have labeled “the globalization of technology.” This boundary-spanning propensity of technology and STI is due mainly to improvements in communications and transportation and the fact that developed and developing nations are spending more on R&D. The globalization of technology illustrates the growing interdependence of science and technology systems, requires both countries and organizations involved in innovation to construct strategies for exploiting extramural research, and places increasing pressure on countries and organizations to develop strategies and systems for scanning and acquiring foreign technology and STI. The Japanese have been notably successful in developing strategies for acquiring foreign technology and STI to increase the international reach of their R&D organizations. The U.S has been much slower, however, in recognizing both the growing interdependence of science and technology systems and the need to develop strategies and systems for scanning and acquiring foreign technology and STI. The dissemination-oriented approach used to transfer government-funded STI, as presently constituted, remains much too passive to be used for scanning and acquiring foreign technology and STI.

CONCLUDING COMMENTS

In closing, we take the position that U.S. technology and STI policy must be closely coordinated and that the present passive dissemination-oriented approach to the transfer of government-funded STI should be replaced with an active knowledge diffusion-oriented system. Further, this system must have an “intelligence” component for scanning and acquiring foreign technology and STI and for matching these acquisitions with domestic needs and activities. (In the absence of cooperative domestic and foreign research projects and the outright purchase of foreign R&D, scanning -- identifying and acquiring useful technology and STI on a global scale and diffusing them domestically -- has the advantage of preserving economies of scale in R&D, providing control over domestic technology and STI, while placing the lowest demand on financial and human resources.) The intelligence component of the knowledge-diffusion system would be used to identify foreign technologies and STI that could accelerate the development and production of new products and services. It would also be used to assess the strength and strategies of key technologies and foreign competitors, to help benchmark domestic and foreign technology, and to help overcome the “not invented here” syndrome, which is not an easy task under the best of conditions.

The U. S. government and firms have historically taken a dim view of allocating funds for scanning activities in particular and STI programs in general. Witness the very low level of support for knowledge transfer and utilization in comparison to knowledge production by the U.S. government and the fact that such activities, even the most modest, are often most vulnerable to

cost-cutting efforts by both management and R&D organizations. In the final analysis, the NII syndrome and the mistaken belief that other nations only build on U.S. science and technolog rather than serve as potential contributors to it will significantly challenge attempts to initiat both a knowledge-diffusion system for transferring government funded STI and any attempts t include a component for a scanning and acquiring foreign technology and STI and for matchin these acquisitions with domestic needs. We remain convinced, however, that an activ knowledge-diffusion system that has a scanning component offers the best hope for maintainin U.S. preeminence in aerospace and restoring it to a preeminent position in other high technolog arenas.

ACKNOWLEDGMENT

The survey of Japanese engineers and scientists was funded by a grant from the Society fo Technical Communication. The authors gratefully acknowledge the efforts and contributions c the following individuals: Dr. Robert A. Kilgore, Mr. Seiichi Kawabe, Mr. Keisuke Asai, M Y. Furuya, Mr. Takeshi Yamada, Prof. Tsutomu Adachi, Mr. Ryuji Matsuda, Prof. Hirotosl Kubota, Mr. Tadatoshi Aoyama, Mr. Shigefumi Tatsumi, Mr. Tatsumi Fujimoto, Mr. Atsusl Kaneko, Prof. Yutaka Yamaguchi, and Ms. Denise Beasley.

REFERENCES

Adam, R. (1975). Pulling the Minds of Social Scientists Together: Towards a Science Information System. *International Social Science Journal* 27 (3), 519-531.

Alic, J.A., L.M. Branscomb, H. Brooks, A.B. Carter, and G.L. Epstein (1992). *Beyond Spinoff: Military and Commercial Technologies in a Changing World.* Boston, MA: Harvard Press.

Allen, T. J. (1977). *Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information Within the R&D Organization.* Cambridge, MA: MIT Press.

American Technology Policy: Settling the Frontier. (1992, July 25). *The Economist* 25: 21-23.

Ballard, S., et al. (1989). *Innovation Through Technical and Scientific Information: Government and Industry Cooperation.* NY: Quorum Books.

Ballard, S., et al. (1986). *Improving the Transfer and Use of Scientific and Technical Information. The Federal Role: Volume 2 - Problems and Issues in the Transfer and Use of STI.* Washington, DC: National Science Foundation. (Available from NTIS, Springfield, VA; PB-887-14923.)

Beyer, J.M. and Trice, H.M. (1982). The Utilization Process: A Conceptual Framework and Synthesis of Empirical Findings. *Administrative Science Quarterly* 27, 591-622.

Bikson, T.K., Quint, B.E. and Johnson, L. L. (1984, March). *Scientific and Technical Information Transfer: Issues and Option.* Washington, DC: National Science Foundation. (Available from NTIS, Springfield, VA; PB-85-150357; also available as Rand Note 2131.)

Branscomb, L.G. (1991). Toward a U.S. Technology Policy. *Issues in Science and Technology* 7 (4), 50-55.

Burton, D.F. (1992). A New Model for U.S Innovation. *Issues in Science and Technology* 8 (4), 52-59.

Cheney, D.W. and W.W. Grimes (1991, February). *Japanese Technology Policy: What's the Secret?* Washington, DC: Council on Competitiveness.

Clinton Fleshes Out Technology Policy (1993, February 23) *Daily Press* B9.

Cutler, R.S. (1988). Survey of High-Technology Transfer Mechanisms in Japan and the USA. *Technology Transfer* (Fall), 42-48.

Eveland, J.D. (1987, March). *Scientific and Technical Information Exchange: Issues and Findings.* Washington, DC: National Science Foundation. (Not available from NTIS.)

Friedman, D.B. and R.J. Samuels. (1992, April). *How to Succeed Without Really Flying: the Japanese Aircraft Industry and Japan's Technology Ideology.* Paper presented at the "Conference on Japan and the U.S. in Pacific Asia." April 1-3, 1992, San Diego, CA. (Available from the MIT Japan Program as MITJP 92-01.)

Funk, J. (1988). How Does Japan Do It? *Production* 100 (8), 57-62.

Goldhor, R.S. and R.T. Lund. (1983). University-to-Industry Advanced Technology Transfer: A Case Study. *Research Policy* 12, 121-152.

Haas, C. and J.L. Funk. (1989). Shared Information: Some Observations of Communication in Japanese Technical Settings. *Technical Communication* 36 (4), 362-367.

Hall, E.T. (1976). *Beyond Culture* Garden City, NJ: Doubleday.

Hernon, P. and T.E. Pinelli. (1992, January). *Scientific and Technical Information (STI) Policy and the Competitive Position of the U.S. Aerospace Industry.* Paper presented at the 30th Aerospace Sciences Meeting and Exhibit, Reno, NV. Washington, DC: AIAA (AIAA-92-0796).

Industrial Policy: Call It What You Will, The Nation Needs a Plan to Nurture Growth (1992, April 6). *Business Week*, 70-76.

Innovation: The Machinery of Growth. (1992, January 1). *The Economist*, 17-19.

Kitchen, P. and Associates. (1989, March). *A Review of the Feasibility of Developing a Methodology to Demonstrate the Value of Canadian Federal Libraries in Economic Terms.* Ontario, Canada: Paul Kitchen & Associates.

Kohl, J.R., R.O. Barclay, T.E. Pinelli, M.L. Keene, and J.M. Kennedy. The Impact of Language and Culture on Technical Communication in Japan. *Technical Communication* 40 (1), 62-73.

McGowan, R.P. and S. Loveless. (1981). Strategies for Information Management: The Administrator's Perspective. *Public Administration Review* 41 (3), 331-339.

Mowery, D.C. (1985, November). Federal Funding of R&D in Transportation: The Case of Aviation. Paper Commissioned for a Workshop on *The Federal Role in Research and Development*, November 21-22, 1985, held in Washington, DC, and sponsored by the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine.

Mowery, D.C. (1983). Economic Theory and Government Technology Policy. *Policy Sciences* 16, 27-43.

Office of Science and Technology Policy. (1982, November). *Aeronautical Research and Technology Policy Volume 2 - Final Report.* Washington, DC: Executive Office of the President, OSTP (Available from NTIS, Springfield, VA; 83N23268; AKA the Keyworth Report.)

Phillips, K.P. (1992) U.S. Industrial Policy: Inevitable and Ineffective. *Harvard Business Review.* (July-August), 104-112.

Pinelli, T.E., J.M. Kennedy; and R.O. Barclay. (1991). The NASA/DoD Aerospace Knowledge Diffusion Research Project. *Government Information Quarterly* 8(2) 219-233.

Roberts, E.B. and A.L. Frohman. (1978). Strategies for Improving Research Utilization. *Technology Review* 80 (March/April) 32-39.

Raloff, J. Tackling R&D Stagnation (1992). *Science News* 142 (12, September 19) 190-191.

Samuels, R.J. and B.C. Whipple. (1989). Defense Production and Industrial Development: The Case of Japanese Aircraft. In *Politics and Productivity: The Real Story of Why Japan Works.* C. Johnson, L.D. Tyson, and J. Zysman (eds.) NY: Harper Business, 275-318.

Solomon, T. and L.G. Tornatzky. (1986). Rethinking the Federal Government's Role in Technological Innovation. In *Technological Innovation: Strategies for a New Partnership.* D.O.Gray, T. Solomon, and W. Hetzner (eds.) NY: North-Holland Publishing, 41-53.

Tornatzky, L. G. and M. Fleischer (1990). *The Process of Technological Innovation.* Lexington, MA: D.C. Heath Company.

U.S. Department of Commerce. (1992, January). *U.S. Industrial Outlook '92: Business Forecasts for 350 Industries.* Washington, DC: Government Printing Office.

Vernon, R. (1987). Coping With Technological Change: U.S. Problems and Prospects. In *Technology and Global Industry: Companies and Nations in the World Economy.* B. Guile and H. Brooks (eds.) Washington, DC: National Academy Press.

Williams, F. and D.V. Gibson (Eds.). (1990). *Technology Transfer: A Communication Perspective*. Newbury Park, CA: Sage Publications.

Foreign Technology Tracking at MCC's International Liaison Office

Mr. Howard Curtis, Senior Research Analyst, International Liaison Office, Microelectronics and Computer Technology Corporation (MCC)

The Microelectronics and Computer Technology Corporation (MCC), founded in 1983, is a private North American research consortium, with a membership of approximately 80 firms, national laboratories, government agencies, and universities. MCC's International Liaison Office (ILO) tracks developments abroad in R&D and market factors related to high technology, and reports its findings through a variety of reports, briefings, electronic databases, and consulting services to the MCC membership. On an occasional basis, the ILO also works on consulting projects under contract to non-member firms.

ILO's technology monitoring efforts cover approximately the spectrum of fields where MCC's research programs are active. These include semiconductor packaging and interconnect; hardware component technologies for computers, including displays, mass storage devices, and batteries for portable electronics; computer architectures and systems; distributed systems; software development environments; advanced database technologies; artificial intelligence and knowledge-based systems; applications of software and systems; and networking and telecommunication. In terms of geographical coverage, ILO concentrates on Japan, Korea, Taiwan, and northern Europe, with an increasing emphasis on eastern Europe. Japanese technologies of interest to MCC members currently consume approximately 50 percent of the group's overall effort.

ILO activities and services to MCC member organizations include

- The publication of a monthly MCC technical report called the *Global Technology Monitor*, which provides an overview of key developments abroad

- Preparation of occasional in-depth technical reports on topics in foreign technology of high interest to the MCC membership

- Technical briefings and presentation at MCC member sites on developments in foreign technology
- Initiation and coordination of multi-firm "competitive technology tours" of laboratories, high-technology firms, and government agencies abroad
- Short courses and seminars in topics related to foreign technology and R&D
- Consulting services
- Searches for sources of technology abroad
- Assistance in the marketing and licensing of technology abroad
- Profiling and evaluation of potential business and alliance partners abroad
- Translation services
- Literature searches; database searches; general reference services in the foreign technology arena

In spring 1993, the ILO concluded a subcontract with the federally funded Japanese Industry and Management of Technology (JIMT) program in order to provide database services to the eight JIMT centers in U.S. universities. Under this arrangement, staff members in JIMT centers will have access over the national Internet to ILO's databases on foreign technology, and ILO will structure a system that permits each of the university centers to input information from its own research, document collection, instruction, and internship programs for shared use by all centers and by the MCC membership.

The presentation transparencies which follow provide further background information on the activities of the International Liaison Office. Questions may be directed to

Howard Curtis
Senior Research Analyst
International Liaison Office
MCC
3500 West Balcones Center Drive
Austin, Texas 78759-6509
Telephone: (512) 338-3792
Fax: (512) 338-3898
E-Mail: curtis@mcc.com (Internet)

MCC International Liaison Office

Mission

- **Monitor**: Developments abroad in semiconductor packaging, microelectronics, computer components, computer systems, software, software dev. environments, adv. database systems, intelligent systems, networking, and telecommunications

- **Inform**: MCC membership of developments in foreign R&D; increase MCC members' access to information about foreign R&D

MCC/International Liaison Office March 1993

MCC International Liaison Office

ILO Services

- MCC Monthly Report on Foreign Technology
- Technical Reports on Foreign Technology
- Presentations and Briefings
- Consultations with ILO Analysts
- Translations

MCC/International Liaison Office March 1993

MCC International Liaison Office

ILO Services (cont.)

- Maintenance of ILO Databases
  - Nickdat: Index to Japanese language periodical literature in computing and electronics
  - GIST: Publications, people, laboratory descriptions, site visit records, etc. related to R&D abroad

MCC/International Liaison Office March 1993

MCC International Liaison Office

ILO Services (cont.)

- Literature Searches and Background Information on Foreign R&D Developments
- Assistance with In-house Technology Monitoring
- Coordination of Competitive Technology Tours
- Identification and Evaluation of Foreign Partners, Sources of Technology, and Licensees
- Special Projects with MCC Members

MCC/International Liaison Office March 1993

MCC International Liaison Office

Audience

- MCC Shareholder Companies
- MCC Associate Members
- MCC Research Projects
- [Japan Industry and Tech. Management Program]

Staff

- 10 FTE

MCC/International Liaison Office March 1993

MCC International Liaison Office

Selected Goals for 1993

- Tune Coverage of Analysis to Meet MCC Shareholder Needs
- Increase Frequency of Visits to MCC Members for Tech. Briefings and Discussion
- Enhance Contents of ILO Databases
- Make ILO Databases Available under Easier-to-Use Interface; Increase Access by End-Users
- Begin Prototypical Electronic Distribution of Recent Information (Electronic ILO Newsletter)

MCC/International Liaison Office March 1993

MCC International Liaison Office

Issues in Tracking R&D in Japan

- How do we combine general knowledge of Japanese technology and domain-specific expertise?
- How do we add quantitative description and prediction to qualitative analysis?
- How do we better exploit electronic databases and networks to inform the research community about R&D abroad?
- How do we combine technology tracking with technology licensing, technology brokering, and alliance-making?

MCC/International Liaison Office March 1993

MCC International Liaison Office

Analytical Staff and Areas of Coverage -- Japan

Microelectronics packaging and interconnect; CAD

Jackson Hwang, Analyst (512-338-3350; hwang@mcc.com)
Masako Robertson, Res. Assistant (512-338-3694; masako@mcc.com)

Superconductivity; batteries; neural networks; optoelectronics; display technologies

Chang-Kyu Kim, Analyst (512-388-3219; changkyu@mcc.com)
Tamami Davidson, Res. Assistant (512-338-3228; davidson@mcc.com)

Computer architecture; software; telecommunications; information systems; AI; human interface

Howard Curtis, Analyst (512-338-3792; curtis@mcc.com)
Jeff Carter, Res. Assistant (512-338-3233; carter@mcc.com)

MCC/International Liaison Office March 1993

MCC International Liaison Office

Analytical Staff and Areas of Coverage -- Europe

All Technical Fields

Marcus Carpenter (512-338-3330; carpenter@mcc.com)

Diane Culp (512-338-3229; culp@mcc.com)

Colleen Wilson (512-338-3391; cwilson@mcc.com)

MCC/International Liaison Office March 1993

Luncheon Speaker, Day One

3M's International and Japanese Experience

Dr. Geoffrey C. Nicholson, Staff Vice President, International Technical Operations, Research and Development, 3M Corporation

3M is one of the world's leading manufacturing companies. We are a leader in most of our markets. We are a global company in 57 countries and have sales in more than 200. We are an innovative company with more than 60,000 products. At least 25 percent of our annual sales are the result of new products introduced within the last five years. In 1992, 3M's worldwide sales were $13.9 billion and in Japan sales were more than $1.1 billion.

3M's Worldwide R&D employs over 8,400 people and spends nearly 8 percent of our sales revenues or over $1 billion on R&D. Our major non-U.S. laboratories are located in Canada, the UK, Germany, France, Belgium, Italy, and Japan. These laboratories employ over 2,700 people.

The key to 3M's worldwide success is the company's unique corporate culture that nurtures innovation and encourages the sharing of information. We follow the 15 percent rule that is, we give our researchers 15 percent of their time to work on projects of their own choosing, and look for ways to combine technologies. The 3M culture stresses informality, entrepreneurship (we have product champions), and a supportive management that understands that a lack of success is a learning experience and that many of our formal, new product programs fail.

3M fosters an entrepreneurial environment by hiring enterprising people, sharing information, trusting and rewarding our employees, and tolerating failure. There is also an expectation that new products will be developed, that our scientists will have monitored outside developments, and that our inventions will be "multi-technologies" or technologies with numerous applications. Examples of multi-technologies are precision coating, non-wovens, membrane science, laser processing, optical recording, artificial intelligence, and microstructured surfaces.

The location internationally of 3M labs is a direct result of responding to local business needs. 3M management understands that it is *imperative* to have in-country labs to be close to our customers, follow market and technology trends quickly, and respond cost-effectively to markets and competition. 3M wants to be located where the world's technological leaders are.

The Japanese are the world's leaders in many product development technologies and it is, therefore, imperative for 3M to be in Japan. Sumitomo 3M, 3M's joint venture company in Japan, serves as a lightening rod and listening post for developments in Japan. Personal contacts with our Japanese staff are a chief source of information on Japanese science, technology, and markets. This is an important reflection of 3M's information strategy.

At 3M "information is useful if it produces a useful result." Information exchange among those who share 3M's corporate culture is our company's most vital source of S&T information. For 3M's international laboratories it is the sharing of information among our scientists that is critical. This personal method of information gathering has added benefit to information brokers or librarians. Useful information is gathered by those who understand the subject matter, are scientists in the subject at question, and can immediately transform their knowledge into results. These information exchanges not only stimulate new ideas, but also increase productivity and reduce information duplication.

Although there are drawbacks of personal information exchange: information hoarding, information fiefdoms, no way to judge if the information is accurate or complete, and possible duplication of efforts in other parts of the company, I have found the advantages to be profound. If anything, American managers and scientists should become more familiar with Japan's scientific community's information structures and sources. An American manager who can ask the right questions and direct his staff to the right resources is an effective manager.

It is the personal, human network for information gathering that I have found to be the most successful. I hope that the papers presented at this conference will help you better understand how to create an

effective human network in Japan. The following presentation transparencies describe in more detail 3M's R&D operating principles and Sumitomo 3M.

3M
INTERNATIONAL R&D OPERATING PRINCIPLES

- WELL-DEFINED MISSIONS
- REGIONALIZED CENTERS
- LOCALLY-BASED LEADERSHIP
- LABORATORIES ARE EXTENSIONS OF EACH OTHER
- SHARED TECHNOLOGY
- PLACE LABORATORIES WHERE ACTION AND CUSTOMER ARE LOCATED
- PROTECTION OF INTELLECTUAL PROPERTIES
- WINDOW ON NEW TECHNOLOGIES AND COMPETITIVE ACTIVITIES

THINK GLOBALLY, ACT LOCALLY !

RULES TO AVOID INNOVATION

- *Be suspicious of every idea that originates below you*
- *Insist that people go through all levels with a new idea*
- *Express criticism and withhold praise*
- *Make a decision to reorganize in secret and maximize surprise*
- *Be control conscious*
- *Never forget that people at top know everything*

3M's Innovative Environment

- Employment stability
- Individual freedom
- Openess to risk and tolerance for "failure"
- Technology sharing and cross-fertilization
- Management avoidance of "wrong signals"
- Reward and recognition programs

Technological Competitiveness

Provide technical content to customer:

* **Leading edge technology with features, advantages, benefits**
* **Product modifications**
* **Professional Technical Service**
* **Value**

GLOBAL TECHNOLOGY MANAGEMENT

INCREASING SPENDING FOR R&D ALONE IS NOT THE KEY TO BETTER TECHNOLOGY MANAGEMENT.

Higher levels of R&D spending does not guarantee success in global markets. The key is the links between its market needs and customer requirements.

GCN5

GLOBAL TECHNOLOGY MANAGEMENT

EXTERNAL RELATIONSHIPS AND LEVERAGING ARE BECOMING MORE IMPORTANT.

Because of the costs and risks associated with R&D, no company can become a technological island. Creativity and innovation require the outside stimulation.

GCN4

GLOBAL TECHNOLOGY MANAGEMENT

"MARKETS ARE GLOBAL -
TECHNOLOGY DEVELOPMENT IS NOT"

New Technology and specialized talent that produces it will continue to be developed locally - the results are global.

GCN2

A Laboratory in Japan

- *Supports our Current Business*
- *Grows our Future Business*
- *Is Alert to Competitive Threat*
- *Is Close to Leading Customers*
- *Is Close to Technology Development*

Sumitomo 3M

Joint Venture

50%	3M
25%	NEC
25%	SEI

Exclusive License to Manufacture

Non-exclusive License to Import, Convert, Sell

***From* 3M *To* Sumitomo 3M**

Sumitomo 3M

Laboratory

Technical Sales Support

Product Engineering

Product Modification

R&D In Universities, Institutions and Corporations

In Japan	94%	Read and Write English
	85%	Read English Journal Articles
In America	4%	Read Japanese
	9%	Read Translated Papers
In Japan	85%	Attended Tech. Mtgs. Outside of Normal Work; 2/Month
In America	30%	" " " "
In Japan	83%	Aware of Foreign Activity in Their Field
In America	30%	" " " "
In Japan	60%	Had Spent +1 Year Outside
In America	34%	" " " "

Part III. Suppliers of Japanese S&T Information

Accessing Information on Japanese Companies Through Dialog's Teikoku Database

Mr. Richard DeTurck, Director, Dialog Information Services

Dialog is the world's largest database host distributing 450 databases in over 110 countries. Many of Dialog's databases can be useful gathering and tracking information on Japan. One of the most interesting database that Dialog distributes that directly relates to Japanese business is "File 502."

File 502 is the English-language version of the Teikoku Databank. Teikoku is the largest producer of databases on Japanese companies and corporations. It is also among the oldest companies in Japan producing credit information. Dialog's Teikoku file has information on over 180,000 companies and is updated monthly. You can locate individual companies or companies by industry, location, or financial standing.

The following two charts demonstrate some of the information that you can obtain from Teikoku. A sample company profile contains the English and Romanized Japanese names of the company; address; telephone and fax numbers; primary and secondary product codes; financial information (sales, profits, dividends, and capitalization); national sales ranking; credit rating; banks; and information about the chief executive officer.

Sample Record From Teikoku Databank, File 502 on Dialog

0168613
CANON SALES CO INC
KYANON HAMBAI KK
MITA DAIICHISEIMEI BLDG. 11-28, MITA 3-CHOME
MINATO-KU, TOKYO 108

Telephone: 03-3455-9111

Primary Product:
4086 (OPTICAL MACHINERY, PHOTOGRAPHIC MACHINERY, ETC.)
Secondary Product:
4082 (GENERAL MACHINERY AND EQUIPMENT FOR OFFICE WORK, ETC.)

Date of Incorporation: 02/1968
Paid-in Capital (000): Y40,588,000 $112,591 ($1=Y360.4)
Credit Rating: A (92)
Number of Employees: 8,699
Number of Shareholders: 3,175
Sales Ranking: 1 of 537 companies
Declared Income (000): (12/1991) Y20,830,360 $162,686 ($1=Y128.0)
(12/1990) Y20,765,670 $155,095 ($1=Y133.8)

		Latest Annual 12/1991		Previous Annual 12/1990
Sales (000):	Y	502,771,000	Y	456,091,000
	$	3,926,671	$	3,406,460
Profits (000):	Y	8,431,000	Y	8,339,000
	$	65,846	$	62,282
Dividends (%):		25		25
Capitalization (%):		44		46
		($1=Y128.0)		($1=Y133.8)

Top 10 Banks:
FUJI BANK, HAMAMATSUCHO
SAKURA BANK, GOTANDA EKIMAE
SANWA BANK, MITA
SUMITOMO BANK, SHIMBASHI
NORIN CHUKIN BANK, H O
BANK OF TOKYO, GINZA
TOKAI BANK, GINZA
DAI-ICHI KANGYO BANK, H O
BANK OF YOKOHAMA, H O
YASUDA TRUST AND BANKING, H O
THIS IS:
a CORPORATION
a(n) LISTED company

Teikoku Company Number: 985142611

Chief Executive:
TAKIGAWA, SEIICHI
2-12, SHIBOKU 1-CHOME
MIYAMAE-KU, KAWASAKI 216

Telephone: 044-854-034
Birthdate: 01/12/1931
Birthplace: TOKYO
Education: THE UNIV OF TOKYO

The financial figures expressed in Yen are provided by Teikoku Databank. The dollar equivalent figures are merely estimates and are for informati onal purposes only.

Sample Report From Teikoku Databank, File 502 on Dialog

Product Code 4086, Optical and Photo Machinery (Top 15 of 200 Ranked by Sales)

Romanized Company Name	Company Name	Sales (000$)
KYANON HAMBAI KK	CANON SALES CO INC	3,926.671
NIHON KODAKKU KK	KODAK JAPAN LTD	796.626
ASANUMA SHOKAI KK	ASANUMA & CO LTD	650.390
KASHIMURA KK	KASHIMURA CO LTD	517.776
ORIMPASU HAMBAI KK	OLYMPUS JAPAN CO LTD	491,299
MISUZU SANGYO KK	MISUZU CO LTD	369.057
OMIYA SHASHINYOHIN KK	THE OMIYA PHOTO SUPPLY CO LTD	351.889
NIHON PORAROIDO KK	POLAROID CORPORATION OF JAPAN	288.972
NIKON KAMERA HAMBAI KK	NIKON PHOTO PRODUCTS INC	263.435
MINORUTA KAMERA HAMBAI KK	* NOT KNOWN	240.855
KARU TSAISU KK	CARL ZEISS CO LTD	148,920
ASAHI KOGAKU SHOJI KK	ASAHI OPTICAL CORP	145.815
KOSEKI KK	* NOT KNOWN	88.504
MEGANE DORAGGU KOGYO KK	* NOT KNOWN	81,906
KENKO KK	KENKO CO LTD	72.975

NIKKEI Telecom (Nihon Keizai Shimbun, Inc.)

Mr. Pier Friend, Databank Sales Representative

NIKKEI is Japan's largest and most authoritative news and data source for business and economics. It is the primary authority for all business-related information in Japan. For those who are unfamiliar with NIKKEI as a publishing company, you may know our stock indexes of which the Nikkei Average, a listing of 225 stocks, is most commonly quoted. The NIKKEI average is followed in Japan and internationally much in the same way as the Dow Jones Industrial average is in the United States.

The *Nihon Keizai Shimbun*, commonly referred to as NIKKEI, was established in 1876 as a business newspaper publisher. NIKKEI now publishes 5 newspapers, and many periodicals, books, and magazines. The largest newspaper, and the company's namesake, is the *Nihon Keizai Shimbun*. It is considered the premier business daily in Japan. With a circulation of around 3,000,000 it is the largest financial daily in the world, 1.5 times bigger than the daily circulation of *The Wall Street Journal*, which is published by Dow Jones & Company. NIKKEI also publishes four other newspapers, of which the *NIKKEI Weekly*, formerly titled *The Japan Economic Journal*, is written in English

NIKKEI books and periodicals have an even larger market share than do its newspapers. In total, NIKKEI publishes 38 magazines, 16 newsletters, and over 300 books exceeding 5,000,000 in circulation. NIKKEI's extensive and comprehensive coverage of a wide variety of subjects can be attributed to its over 2,000 correspondents worldwide.

Although NIKKEI is primarily a publisher, the company has expanded into modern media to remain on the cutting edge of technology, and to provide information and data in the most advanced methods possible. NIKKEI's other media include electronic data services, broadcasting, business and corporate events, and seminars and symposia. These media allow NIKKEI to cover all forms of information circulation and to position itself as Japan's primary source of reference for now and into the future.

NIKKEI's Databank Bureau, a computerized electronic data service, is the fastest growing business of NIKKEI. This is due to the rapid demand for information about Japan, whether it be news, corporate information, market information, or science and technology. The NIKKEI Databank is the leading source of Japanese information in Japan for two reasons: it is **the** primary source for news in and about Japan, and it provides it in an accurate and timely manner.

Until recently, current and comprehensive information about Japan was very difficult to obtain. If the information was available it was written in Japanese, which prevented most non-Japanese people from accessing it. To access information it had to be requested and sent for by mail, which further slowed the process and made the eventual arrival of the information less valuable. News and information often needs to be accessed immediately if its full value is to be realized. NIKKEI brings you on-line information on practically every Japanese subject you will need to know about. From cryogenics to corporate profiles, semiconductors to stocks, aerospace to artificial intelligence, it can all be found through NIKKEI. To bring this information to you in a rapid and convenient medium, NIKKEI developed its PC-based online service called Nikkei Telecom Japan News & Retrieval, or more commonly Nikkei Telecom. This service allows you to access any time of day, in English, Nikkei's databases.

The databases on this service can be divided into **five** immediate areas: news information, corporate information, market information, industrial information and macroeconomic information. (There are many others which are covered on the service, although I will not go into them at this time.)

1. News

(Broadcast) In today's world it seems that everyone wants their information just a little faster. The broadcasting mode of the Nikkei Telecom database provides real-time articles which are automatically displayed as they come in from Tokyo. When a certain headline catches the user's eye, the full article may be called up. Full-text articles which are scheduled to appear in tomorrow's *Nihon Keizai Shimbun* are translated and appear as soon as they are filed. Top stories from the

NIKKEI Industrial Daily and the *NIKKEI Financial Daily* are also available. Articles from *The Japan Times*, an English daily in Japan, are also available the day before delivery.

(News) Every day over 450 articles are released for your viewing. Tomorrow's, today's, and yesterday's articles are all compiled on a special menu to allow you easy access to the most recent articles by newspaper publication.

(Text Search) In total, there are over 1,000,000 articles which are available for text search purposes. In text search mode you can access every periodical and publication in Nikkei's database. Just by entering in key words, you have access to up to ten years of information on any topic that is of interest to you. You can get as specific or as general as you like, depending on the parameters of your search. Over 50 newspapers, periodicals, newsletters, and reports written in English are accessible. To name just a few: the *Nihon Keizai Shimbun*, the *NIKKEI Industrial Daily*, the *NIKKEI News Bulletin*, *The NIKKEI Weekly*, *The Straits Times, The Japan Times, The Far Eastern Economic Review, Focus Japan (a JETRO newsletter), Digest of Japanese Industry and Technology*, the *National Technical Report*, the *Nikkei High Tech Report* (which features comprehensive coverage of Japan's high-tech industry), and many other sources which I have not mentioned.

Major articles from a variety of Nikkei newsletters covering such issues as the markets, commodities, and the high-tech industry are available in both the news and text search modes of Nikkei Telecom. These are accessible on the day of publication and stored in text search. Examples of some of the newsletters from high-tech companies are: the *National Technical Report* by Matsushita Electric, *Technical Review* by Mitsubishi Heavy Industry, *Sanyo Technical Review* by Sanyo, and *Bulletin* from Toppan Printing.

2. Corporate

There are basically two separate categories of corporate information that can be accessed from NIKKEI. The first is the Japanese corporate profile database which covers companies listed on Japan's 8 exchanges. Corporate profiles, financial statements, capital investment projects, and more can be accessed. The corporate profile section can be quite

detailed, depending on the company one is searching. I believe that Sony's corporate profile alone is over 40 pages of information. The second, Asian Corporate profiles, contains information on major Asian companies and Japanese-invested companies in Asia. Basic financial data and a corporate outline is available for 12,000 Chinese industrial companies, 1,900 Korean-listed companies, 800 listed companies in Southeast Asia, and 1,200 Japanese-invested companies in Southeast Asia.

3. Market

Market information covers all of Japan's 8 exchanges in stocks, bonds, futures, options, indices, forex, and commodities. Information is available on a daily basis with updates during the day. One can access 900 days of daily data, ten years of weekly data, 20 years of monthly data, and annual data since 1964.

4. Industrial

The information in this database includes production, shipment and inventory indices for all of the major industrial groups.

5. Macroeconomic

Macroeconomic statistics cover national accounts, trade and balance of payments, finance and tax, labor, price, and products, among others.

To access NIKKEI's information quickly and easily, all you need is a personal computer and a modem. For those of you who don't feel computers are your best friend, you will find that retrieving information from the databases is very easy. The online service is menu-driven, and very few commands are necessary to access the data that you need. Furthermore, there are help functions at many of the menus and there is an online manual for the particularly perplexed.

The Japanese-language version of NIKKEI has more extensive news coverage, because there is no need for translation. The Japanese NIKKEI Telecom news section includes 1500 real time flash reports and news articles per day. Retrievable articles include not only those

from the newspapers available in our English version, but also 20 other newspapers such as the *Asahi Shimbun*, the *Mainichi Shimbun*, local papers, sports papers, and technical papers such as *Nikkan Kogyo Shimbun*, *Tekko Shimbun*, and *Denki Shimbun*.

In the Japanese version of Nikkei Telecom, magazine articles are available for retrieval. Most important, Nikkei business publication's magazines are included. For example, *Nikkei New Media*, *Nikkei BIOCHEM*, *NIKKEI Artificial Intelligence*, and *NIKKEI Aerospace.* JICST's JOIS is also available, adding updates twice per month and more than 5.3 million articles on science and technology. This is added to Nikkei's over 10 million articles from newspapers, magazines, and newsletters. Furthermore, the Japanese corporate profiles are even larger and more extensive; there is a who's who section and a section for new product releases. For numerical information, such as macro and micro economic statistics, the English and Japanese versions cover the same amount of information.

Access to the databases is very simple. Everyone, anywhere in the country using a personal computer and a modem can access NIKKEI's data. NIKKEI's host computer is located in Tokyo, however, for your convenience there is a computer center in New York and communications lines set up in Washington D.C. and Los Angeles. For those who want to access the system from another location, access can easily be established through TYMNET. Online services are also available in a variety of fee formats to suit your usage needs and expectations. For those of you who wish to access the Japanese version of Telecom, NIKKEI will provide you with a software diskette that allows your computer to be *Kanji* compatible.

I have tried to show you that NIKKEI is the leader in Japanese news and information provision. There are literally hundreds of thousands, if not millions of science and technology articles that are available to you on-line through NIKKEI NIKKEI provides its information in both Japanese and English. All you need is a computer and a modem, and fee structures are flexible.

Accessing "Grey Literature" in Japan

Mr. Carlton Williams, University of Tokyo/J-TIES

Although Japan is more open to sharing scientific and technical information than in the past, it is still relatively difficult for non-Japanese parties to obtain access to "grey" literature on a timely basis. Each year a massive amount of research results is disclosed in myriad fields and sub-fields of technical research in an end user's field of interest can be a confusing task for one not familiar with the organization of the Japanese technical community.

Further, many of the disclosed results are of inferior quality or of minor importance to the particular technical field. Such disclosed results can be thought of as the "low-grade ore" through which one must prospect for the "gems," the papers of true significance in a particular technical field. However, gathering a selection of grey literature to evaluate to determine the few that are of superior quality can be a laborious and expensive task if undertaken by an end user.

To alleviate these problems, it is useful to understand the manner in which the technical community is organized. Further, it is useful to have a system of weeding out the "gems" from the "low-grade ore" before the materials are passed on to the end user. This paper will generally describe the organization of the Japanese technical community, using the *Nihon Kohgakkai* (the Japanese Federation of Engineering Societies) as an example. Further, a solution to the problem of evaluation will be described.

Organization of Academic Societies

All technical societies in Japan are organized under the *Nihon Kohgakkai*. There are 88 separate technical societies, claiming over 550,000 members. However, this number is misleading, since there is some overlap, with many members belonging to more than one society. The total is further inflated by the large number of students that become new members upon graduation, often automatically or for a relatively inexpensive fee. After an initial five year period, only an estimated 20 percent of these new members elect to renew their membership.

These technical societies are further subdivided into numerous "technical meetings." Technical meetings are committees organized around particular fields of research interest for a determined period of time. The number of these organizations varies widely among the Technical Societies. For example, in 1990 the Japan Society of Applied Physics (JSAP) had 47 Technical Meetings, whereas the Institute of Electronics, Information and Communications Engineers (IEICE) had only 13.

Research Disclosure

There are essentially three stages in the information disclosure process in Japan: presentation at the technical conferences, discussion at technical meetings, and formal publication in trade journals. A technical conference provides a forum for brief presentations of the latest research results. The periodic technical meetings provide a means for researchers to gather and discuss the latest research progress on a regular basis. Finally, the journals are the formal recording of the completed work.

Technical Conferences

Each year there are numerous regular technical conferences organized by technical societies, technical meetings, and various joint committees. These technical conferences are usually divided into a variety of subfields (please refer to Appendices A and B for samples from the IEICE and JSAP). These conferences generate the majority of disclosed research results. Most of these technical conferences meet once or twice a year, and are open to all. However, only members are allowed to present their results. There is no limit on the number of papers for presentation, but the time allotted for each is generally 15 to 20 minutes. Abstracts are published for attendees at the time if the conference, and are obtainable only upon attendance.

By way of example, the average number of research disclosures in recent years at the JSAP Conference has been approximately 3,300, and at the IEICE Conference, approximately 3,000. These societies both

hold their conferences on a semi-annual basis, hence the yearly figures for research disclosures within these two technical societies alone are 6,000 to 7,000 apiece.

Recently, an attempt to make the process more accessible to interested parties from other countries or "internationalization" has been encouraged. This generally takes the form of the so-called international conferences, for which greater efforts are made to invite representatives from abroad. In many of these international conferences, the majority of presented papers are in English, due to the commitment of the organizers to greater internationalization. However, not all technical societies are equally committed at this point in time. For example, IEICE and the Japan Electronics Society (JES) hold approximately the same number of international conferences each year (in 1992, seven for IEICE versus five for JES), but JES does not yet accept English papers.

Technical Meetings

Technical meetings are smaller groups, numbering from 30 to 100 people, organized around a current topic of research interest. As such, membership is strictly limited to those performing relevant work under that topic and those who have strong interests in that topic. These groups meet on a more frequent basis than do technical conferences, usually 6 to 12 times a year. The IEICE maintains 47 such technical meetings, whereas the JSAP has only 13.

The purpose of technical meetings is to provide a support group composed of interested experts who can discuss and evaluate the work the members are performing in that particular field. Papers are presented at every meeting. These papers are normally full papers, 4 to 8 pages, in Japanese. The number presented varies widely, ranging anywhere from 7 to 30 per meeting. These technical meetings are useful as a means of monitoring the progress of research in a particular area. For example, the IEICE holds a meeting every December on compound semiconductor devices, through which one can cover an entire year's progress in this field.

Journals

Journals are the final step in the disclosure process. Most technical societies publish their own journal, usually on a monthly or bimonthly basis. Some of the smaller technical societies publish on an annual or semi-annual basis, but such instances are the exception. Journals are usually available to the general public, and hence do not necessarily come under the rubric of "grey literature," but are mentioned here as a source for technical information.

Papers are subject to a review process prior to publishing. This process ensures that results of research are disclosed in journals as much as two or three years after the research was actually performed. Due to this fact, journals are considered to be of less importance in monitoring ongoing research or the latest research results.

Databases

In addition to the various sources mentioned above, there are several databases in Japan which contain scientific and technical information. Some of these provide fee-based services to the public, while others are limited to the academic community. At this point in time, most of the material exists in the form of abstracts, but there are some full papers available, and the percentage of full papers relative to the whole is expected to steadily increase in the future.

Evaluating Japanese Scientific and Technical Information

As shown, there are many sources and services available to those searching for scientific and technical information. Yet, there is the problem of determining which of the many thousands of papers produced each year are in fact important. Evaluation by the end user is possible, but the time and expense required to gather a sufficient sample of papers are prohibitive.

The solution reached by J-TIES is to retain a "Technical Advisory Committee," composed of experts from academia. These advisory committee members are drawn from many key technical fields, and are easily able to monitor progress in their fields and related fields. When

informed of a need for access to grey literature from a particular technical field, these members are well-placed for quickly and efficiently gathering the most important examples of research disclosures. Further, these experts are qualified to critically evaluate chosen papers for various criteria, such as technical importance and practical impact. In this manner, greater focus is enabled, and considerable effort is saved by the end user.

Conclusion

Despite the recent openness of Japan in scientific and technical information disclosure, it is still relatively difficult for non-Japanese parties to access disclosed research results. This is often due to lack of knowledge of the correct points at which to access information, as well as difficulties inherent in determining which of the myriad disclosures are of real value.

In this paper, we have attempted to clarify the organization of the Japanese technical community. With this organizational structure in mind, it is hoped that the non-Japanese end user will have clearer knowledge of where to access information regarding a particular field of interest. Further, we hope to provide a possible solution to the problem of determining which research disclosures of the thousands produced each year are important.

APPENDIX A

Sub-fields Covered by the Semiannual Conference of the Institute of Electronics, Information, And Communications Engineers

Artificial Intelligence & Knowledge-Based Processing

Antennas & Propagation

Circuits & Systems

Theoretical Foundations of Computing

Component Parts & Materials

Computer Systems

Communication Systems

Data Engineering

Digital Signal Processing

Engineering Acoustics

Electron Devices

Electronic Information Displays

Electromechanical Components

Electromagnetic Compatibility

Electromagnetic Theory

Educational Technology

Fault Tolerant Systems

Human Communications Engineering

Integrated Circuits & Devices

Image Engineering

Information Networks

Information Security

Information Theory

ME & Bio-Cybernetics

Magnetic Recording

Microwaves

Neurocomputing

Natural Language Understanding and Models of Communication

Nonlinear Problems

Optical Communication Systems

Organic Material Electronics

Optical & Quantum Electronics

Office Systems

Power Engineering in Electronics & Communications

Pattern Recognition & Understanding

Reliability

Radio Communication Systems

Space, Aeronautical & Navigational Electronics

Satellite Telecommunications

Superconductive Electronics

Silicon Devices & Materials

Speech

Software Science

Switching Systems Engineering

Ultrasonics

APPENDIX B

Sub-Fields Covered by the Semiannual Conference of the Japan Society of Applied Physics

Radiation and Plasmas

Measurement and Control

Optics

Quantum Electronics

Optoelectronics

Thin Films Surfaces

Beam Technologies

Applied Material Physics

Superconductivity

Organic Molecules and Bioelectronics

Semiconductors A (Silicon)

Semiconductors B (Non-Silicon)

Crystal Engineering

Amorphous Materials

General Applied Physics

NACSIS International: An Update

Professor Hitoshi Inoue, Director, Science Information Research Division, National Center for Science Information Systems (NACSIS) and Professor Hiromichi Hashizume, Science Information Research Division, NACSIS

NACSIS's New Policy to Privatize its Database Services (NACSIS-IR) Abroad

NACSIS has extended its services to Western countries. Connections were made with the U.S. National Science Foundation (NSF) in January 1989, to provide NACSIS-IR, and with the British Library (BL), in February 1991 to provide NACSIS-CAT to some U.K. university libraries, as well as NACSIS-IR service to the BL.[1] These services were supplied primarily to test the feasibility of the telecommunications links with both countries and were funded by a grant for International Scientific Research from the Ministry of Education, Science and Culture (MONBUSHO). The three-year pilot stage ended in 1992 and is considered a great success.

Before embarking on its second stage to internationalize its services, NACSIS recently released a memorandum on fundamental policies of service of NACSIS-IR to foreign countries, as follows [authors' wording]:

> 1. The service will be available to research & higher educational institutions and governmental bodies of foreign countries which have been established to promote the development of academic research.
>
> 2. The service shall be exclusively used for the purpose of scientific research and education, and not for the purpose of profit making.

3. Databases to be offered (**Table 1**) include 1) those produced by NACSIS alone, 2) those by NACSIS and other institutions, 3) those introduced from other institutions that the institutions permit NACSIS to offer them in to foreign countries.

4. Service hours shall be corresponded to the regular operating hours of NACSIS (Japan Standard Time), except the designated holidays. Monday through Friday 9:00 a.m. -- 2:00 a.m. of the following day. Saturdays 9:00 a.m. -- 2:00 p.m.

5. The service shall be charged. The rate and terms of payment will be announced later.

6. Terminals supporting the Japanese language, and communications software shall be supplied by user's own effort.

7. Only one representative will be designated in each institutions to which the user's ID will be issued.

The current plan to reorient NACSIS's database service policy toward foreign countries includes the shift to INTERNET for telecommunications and the introduction of user's defrayment of their user costs. NACSIS will take time to closely examine these points of the reorientation policy and to consult with other affected institutions before reaching any conclusion on how to make a final public announcement and implementing the new policy.

Current Statistics of Utilization of NACSIS-IR and Evaluations by U.S. Users

Utilization of NACSIS-IR through international online access from the United States and the United Kingdom is shown in **Table 2.** One can see that usage is twice as much for the United States as for the United Kingdom, in terms of sheer numbers as well as averages per month. However, if one goes into the details of the uses of each database, one can easily find that the kinds of databases used are totally different between these two countries. In the United States, most of the usage

is concentrated among three groups: 1) so-called grey literature, such as grants-in-aid scientific research which includes research project information funded by the Ministry of Education, Science and Culture; 2) Japanese electronics information presented at the variety of meeting of academic societies in the fields of electronics, control and communications; and 3) biographical and career background information of Japanese researchers included in Directory of Researchers.

In contrast, in the United Kingdom, usage is almost exclusively focused upon the union catalogs produced by NACSIS. The reason is rather simple. Since 1990, NACSIS and the British Library have been engaged in a cooperative research project on the feasibility of a U.K. collaborative catalogue of Japanese publications and the union catalogues produced by NACSIS have been used as the reference sources by participating U.K. university libraries. The project will be explained in the next section.

Ketron, Inc., the NSF subcontractor for the NACSIS database search operations for the American scientific community conducted user surveys several times either by telephone or by mail. Although most of the respondents in United States evaluated the unique value of information they receive from the NACSIS databases, they tended to be unsatisfied with the relevance of the results due, in part, to the uncontrolled vocabulary of the NACSIS databases and the lack of appropriate guidance by U.S. users. Based on the results of these surveys, Ketron, Inc. invented a series of "hot topics" packages, which resolved some of these problems and improved users' effective access to the NACSIS databases.

Report of the Pilot Phase of the Research Project on the Feasibility of a U.K. Collaborative Catalogue of Japanese Publications

The British Library and NACSIS have an agreement to experiment with the feasibility of using records derived from the NACSIS-CAT system to aid in the creation of the union catalogue of Japanese materials in the United Kingdom to be based at Cambridge University and made available over JANET. Toshiba was kind enough to provide five Toshiba laptop computers with Japanese character-sets and the cataloging software. Participating U.K. libraries include: Cambridge

University, Oxford University, Oxford University Oriental Institute, Sheffield University, Stirling University, the BL Oriental and Indian Office Collections (OIOC), and the BL Japanese Information Service (JIS).

Aims, Objectives, and Conclusions

The Project Committee was organized by the participating libraries and the BL provided the R&DD staff which included Dr. Terry Cannon and Mr. Neil Smith and headed by Mr. Brian Perry. This team performed the coordinating function. The Project Committee defined the aims and objectives at its first meeting held at the BL Science Reference and Information Service (SRIS) on Aug. 2, 1990. The Project's aims and conclusions are as follows [2]:

1. To assess the feasibility of compiling a U.K. collaborative catalogue of Japanese publications by connecting to the cataloging system of NACSIS. It was agreed that it is possible to contribute to the compilation of such a union catalogue by deriving records from the NACSIS-CAT system. Problems include record conversion to produce romanized records, conversion to U.K. format, and difficulties of access due to the time differences.

2. To evaluate the effectiveness of the Toshiba computers and software provided by NACSIS. The Toshiba computers were found to have no problems from the point of view of hardware. There are some problems, however, with Lumina software when it is used in the United Kingdom.

3. To evaluate access via JANET to NACSIS-CAT over the British Library-NACSIS dedicated link. Although all the participants can now access NACSIS, there were real difficulties in the initial stages, due to the use of an old standard of X.25, X.25(76), the difficulty of setting and changing parameters in the

Lumina software to suit different local requirements, and the differences in the participants' campus networks.

4. To report on the use of NACSIS-CAT in comparison with other methods of producing a U.K. catalogue of Japanese publications. It has not been possible to carry out a real comparison between NACSIS-CAT and other sources because of the initial delays in connecting to the NACSIS-CAT system and the limited availability of the system due to time differences.

5. To compile a pilot union catalogue from the input of some or all of the participants. No NACSIS-CAT record has been transferred into the Union Catalogue at Cambridge. There remains work to be done on the conversion of NACSIS records to UKMARC format and in setting up the conversion to romanized form. These activities will be pursued in the next stage of the project.

Workshop on Information Resources for Japanese Studies (WIREJAS)

NACSIS is going to hold in December 1993 a Workshop on Information Resources for Japanese Studies in the United States -- Accessibility Issues in Social Sciences and Area Studies -- as a program of International Joint Research funded grant-in-aid by the Ministry of Education, Science and Culture, coming in December. One of the major reasons why NACSIS wants to identify the accessibility problems in the social science and area studies is NACSIS's relative lack of knowledge of these areas compared with other areas, such as the humanities, the pure sciences, and technology. There is also a recognition of the uniqueness of these fields in terms of information gathering activities of these researchers.

The uniqueness of these fields may be highlighted as follows:

1. Primary data is Japanese and is collected in Japan tailored to each research project.

2. Although English is used for reporting the research results, proficiency in Japanese and its vernacular may be required for primary research communication.

3. The subject fields and researchers, individuals or groups, are scattered and obscured in the well-established social science fields such as political science, economics, law, sociology, anthropology, etc.

Because of these unique features, providing documentation and information services in these fields falls behind that of humanistic studies of Japan. In the latter field, time-honored libraries and documentation activities are available for end-users; and in the fields of science and technology, the system of international research communication in English has been well established. Moreover, social sciences and area studies are the domains where information requirements of U.S. scholars are expanding rapidly and are most urgent.

The workshop is planned, therefore, as an opportunity for social scientists and information specialists in these fields from both countries to discuss and exchange information. The workshop will pinpoint six aspects of the issue, namely: database issues, bibliographic control, area centers, careers of scientists, personal exchange, and national plans. Two speakers for each topic from each country were programmed to make presentations. The proceedings of the conference will be published.

REFERENCES

1. Adachi, Jun, "NACSIS: Its Activities and Services," in NTIS *How to Acquire Japanese Scientific and Technical Information, Proceedings of the Conference Held March 26-27, 1992, in Falls Church, Virginia.* Springfield, Virginia. NTIS 1992 p. pp. 81-86.

2. Smith, Neil, "Research Project on the Feasibility of a U.K. Collaborative Catalogue of Japanese Publications -- Report to NACSIS of the Pilot Project" *NACSIS Research Bulletin* 5:113-135 (December 1992).

TABLE 1

List of Databases Supported by NACSIS-IR

1992.10.1 (11.30)

No	Database Name	Call command	Number of Records	Years Covered	Field	Contents	Language
1	Grant-In-Aid Scientific Research	KAKEN	74,700	1985～	All Fields	Research project information with abstracts on research subsidized by Grant-in-Aid Scientific Research, Ministry of Education, Science and Culture	Japanese English
2	Dissertation Index	GAKUI	56,600	1984～	All Fields	Index to doctoral theses submitted to universities in Japan	Japanese
3	Academic Conference Papers	GAKKAI	110,000	1987～	All Fields	Citations with abstracts of conference papers presented to conferences and meetings of the academic societies in Japan	Japanese English
4	Private Grants-in-Aid Research	JOSEI	670	1964～	All Fields	Research project information with abstracts on grant-in-aid scientific research subsidized by private foundations	Japanese English
5	Economic Titles Japan	KEIZAI	66,950	1983～	Economics	Bibliographic citations of literatures on economics	Japanese other languages
6	Summary of Materials of Ishin History	ISHIN	20,380	1846～1871	History	Fulltext of the summary of materials of Ishin (Meiji Restoration)	Japanese
7	Unearthed Wooden Tablets	MOKKAN	13,450	—	History	"Shakumon" (text) of unearthed wooden tablets in Japan and bibliographic citations of the reports	Japanese
8	Directory of Researchers	RES	130,110	As of May 1988	All Fields	Information on research subjects, papers, etc. of researchers in universities	Japanese English
9	Database Directory	DBDR	1,200	As of April 1991	All Fields	Directory of databases created by and/or served at universities in Japan	Japanese
10	Index for General Information of Home Economics Research	KASEI	19,750	1979～	Home Economics	Bibliographic citations of scientific papers in the field of home economics	Japanese

TABLE 1 - CONTINUED

No	Database Name	Call command	Number of Records	Years Covered	Field	Contents	Language
11	RAMBIOS	RAMBIOS	5,380	1983～	Biology	Bibliographic citations of review articles in the field of molecular biosciences	English
12	Union Catalog of Japanese Books Bibliographies Holdings	JBCAT	657,440 4,825,160	Latest	All Fields	Union catalog of books in Japanese language held by university libraries in Japan	Japanese
13	Union Catalog of Foreign Books Bibliographies Holdings	FBCAT	1,615,740 3,492,670	Latest	All Fields	Union catalog of books in European languages held by university libraries in Japan	English other languages
14	Union Catalog of Japanese Serials Bibliographies Holdings	JSCAT	73,000 1,513,030	Latest	All Fields	Union catalog of serials in Japanese language held by university libraries in Japan	Japanese
15	Union Catalog of Foreign Serials Bibliographies Holdings	FSCAT	111,000 916,700	Latest	All Fields	Union catalog of serials in European languages held by university libraries in Japan	English other languages

1) "Number of data records" is as of October 1, 1992
2) English" means not all data records described in English.
(except for FBCAT and FSCAT)

TABLE 2

The number of use for NACSIS-IR through International Line (1992 fiscal year)

NSF & LC

As of March 31, 1993

DB name \ Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total	Average
KAKEN	22	26	9	5	11	19	11	7	6	5	16	17	154	12.8
GAKUI	8	6	0	4	1	2	1	3	2	0	0	1	28	2.3
GAKKAI	—	—	—	—	—	—	—	0	22	21	8	10	61	12.2
GAKKAI1	28	26	7	13	30	13	22	20	—	—	—	—	159	19.9
GAKKAI2	27	7	10	4	17	9	13	7	—	—	—	—	94	11.8
GAKKAI3	2	3	0	2	1	2	0	2	—	—	—	—	12	1.5
GAKKAI4	2	1	0	2	0	1	0	0	—	—	—	—	6	0.8
GAKKAI5	......	......	2	2	0	2	0	0	—	—	—	—	6	0.8
GAKKAI6	2	1	0	1	0	2	0	0	—	—	—	—	6	0.8
GAKKAI7	2	1	0	1	0	4	0	0	—	—	—	—	8	1.0
GAKKAI8	3	0	0	1	0	2	0	0	—	—	—	—	6	0.8
JOSEI	1	3	0	0	1	1	0	0	1	0	0	0	7	0.6
KEIZAI	11	2	1	1	5	2	6	0	1	0	0	2	31	2.6
ISHIN	0	0	1	0	0	1	0	0	1	0	0	0	3	0.3
MOKKAN	—	—	1	0	0	1	0	0	1	0	0	0	3	0.3
RES	23	32	19	5	9	21	4	3	8	10	20	14	168	14.0
DBDR	3	2	0	1	0	1	0	0	1	0	0	0	8	0.7
KASEI	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
RAMBIOS	—	—	—	—	—	0	2	0	2	0	0	0	4	0.3
JBCAT	18	10	5	9	3	3	7	5	8	1	16	4	89	7.4
FBCAT	8	2	0	4	4	3	0	0	1	0	5	3	30	2.5
JSCAT	3	2	1	2	1	2	3	1	10	2	3	0	30	2.5
FSCAT	2	2	0	1	0	2	0	0	2	0	0	0	9	0.8
Total	165	126	56	58	83	93	70	48	66	39	68	51	923	76.9

BL

DB name \ Month	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total	Average
KAKEN	5	0	2	0	1	0	0	0	0	0	2	0	10	0.8
GAKUI	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
GAKKAI	—	—	—	—	—	—	—	0	0	0	0	0	0	0.0
GAKKAI1	0	0	0	0	0	1	0	1	—	—	—	—	2	0.3
GAKKAI2	0	0	5	0	0	0	0	0	—	—	—	—	5	0.6
GAKKAI3	0	0	0	0	0	0	0	0	—	—	—	—	0	0.0
GAKKAI4	0	0	2	0	0	0	0	0	—	—	—	—	2	0.3
GAKKAI5	—	—	0	0	0	0	0	0	—	—	—	—	0	0.0
GAKKAI6	1	0	0	0	0	0	0	0	—	—	—	—	1	0.1
GAKKAI7	2	0	0	0	0	0	0	0	—	—	—	—	2	0.3
GAKKAI8	2	0	0	0	1	0	0	0	—	—	—	—	3	0.4
JOSEI	2	0	1	0	1	0	0	0	0	0	0	0	4	0.3
KEIZAI	0	0	0	0	0	0	1	0	1	0	0	0	2	0.2
ISHIN	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
MOKKAN	—	—	0	0	0	0	0	0	0	0	0	0	0	0.0
RES	0	2	1	0	0	0	0	0	0	0	0	0	3	0.3
DBDR	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
KASEI	0	0	0	0	0	0	1	0	0	0	0	0	1	0.1
RAMBIOS	—	—	—	—	—	0	1	0	0	0	0	0	1	0.1
JBCAT	22	14	10	18	16	28	25	25	14	7	15	11	205	17.1
FBCAT	15	4	9	4	12	16	11	14	2	2	2	4	95	7.9
JSCAT	10	13	5	7	13	6	13	3	2	3	0	7	82	6.8
FSCAT	3	6	2	2	3	3	5	2	1	1	0	1	29	2.4
Total	62	40	37	31	47	54	58	45	20	13	19	23	449	37.4

An Overview of the JICST Databases

Mrs. Hisako Uchida, International Programs Counselor, The Japan Information Center of Science and Technology (JICST)

The Japan Information Center of Science and Technology (JICST) is a semi-governmental organization established Aug. 16, 1957. As a central information organization in Japan, JICST has been collecting, analyzing, and disseminating STI published in and out of Japan and has greatly contributed to the advancement of S&T in Japan.

In the beginning, JICST's collections were comprised mostly of source materials published in overseas countries. JICST's initial, major objective was to disseminate overseas STI in Japan. As Japanese S&T has advanced, the quantity of Japanese STI has also increased. As a result, the proportion of domestic source materials collected by JICST has increased gradually.

In the early 1980s, the national regulation for data transmission was relaxed and foreign online database services became easily available in Japan. In general, databases produced in non-Japanese countries cover less Japanese information than American or European information. Many Japanese users who, although satisfied with the availability of foreign information, began to ask us to expand the coverage of Japanese information in the JICST bibliographic database.

At that time, the JICST online database service had just begun and access was provided only in Japan. Thus, Japanese STI was hardly available to overseas countries. This situation increased overseas customers' demand for Japanese STI. To meet these demands, JICST took the measures to collect Japanese STI comprehensively and to disseminate it worldwide.

Almost eight years have passed since we started providing the JICST online service to overseas customers in 1985. During this period, JICST has promoted the use of JICST's databases at various meetings, such as the annual "Online" conferences held in the United States and the United Kingdom, the International Conference of Japanese Information on Science, Technology and Commerce which has been held three

times, once each in the UK, Germany, and France, as well as at the previous two meetings of the JICST/NTIS conferences that began in 1991.

The questions we encountered at these meetings were similar and can be put into two categories: those directly related to the JICST databases and those related to methods of accessing Japanese databases, in general. Concerning the latter, you can get a clearer understanding by taking a look at the demonstrations in the exhibit room and by obtaining these services' English-language brochures.

Examples of questions about JICST are as follows:

1. Does JICST-E include Japanese authors' articles published in source documents from countries other than Japan?

2. Are all Japanese documents included in the JICST File available in JICST-E?

To best answer these questions and others, I will take a moment to discuss the historical background and some features of the JICST bibliographic databases.

An Introduction of the JICST Bibliographic Databases

JICST started publishing journal abstracts covering worldwide scientific and technical information in 1958. In the late 1960s, JICST developed its own computerized journal abstract compiling and photocomposing system. As a by-product of these efforts, the JICST machine-readable file was produced. In 1975, the subject-indexing procedure was improved by adding a keyword index to the subject classification that was being used, and a new database production system was launched. The secondary document information accumulated from this system has been provided online as the JICST File on Science and Technology (JICST File), the biggest and the oldest JICST database.

In its initial stages, the biomedical sciences were not covered in the JICST collection. Instead, JICST has become the MEDLARS Center in Japan and has been providing access to MEDLINE for more than 20

years. To compensate for the shortage of Japanese medical information in MEDLINE, JICST has been constructing and providing online, since 1981, the JICST File on Medical Science in Japan (JMEDICINE), a database comprised of biomedical documents published in Japan. In order to enlarge the coverage of this database, citations related to life sciences are also added by duplicating those from the JICST File. Since 1986, JMEDICINE has been enlarged by merging the JAMAS (the Japan Medical Abstract Service) database. The JAMAS database is a bibliographic database corresponding to the abstract journal, *Japan Medical Abstracts*, the oldest abstract journal in Japan (started in 1903). Conference papers have a large share in the JAMAS database portion of JMEDICINE.

JICST started providing the online database service to overseas countries in 1985 in response to the strong request for Japanese STI. As all the databases were written in Japanese at that time, the usage was quite low. There are two major reasons.

1. There are few people who have Japanese language reading skills. Therefore, most users who want to obtain Japanese information have to have intermediaries with Japanese language skills in order to access Japanese databases.

2. Terminal equipment, which has the capability for handling the Japanese language, is difficult to buy because of high tariffs.

When JICST started providing the database services overseas, it already had plans to disseminate Japanese information in a language that is most widely used throughout the world. In 1985, the construction of an English-language bibliographic database comprised of documents published in Japan, JICST-E, was started. JICST-E has been provided online since 1986.

During the period of 1986-1990, a practical Japanese-English machine translation system was developed. The system has been used for the JICST-E production since 1991. In 1992, about 10,000 Japanese abstract texts, and all Japanese titles whose English titles are not described in original articles, have been automatically translated. The 10,000 abstract texts thus translated have a share of about 8 percent of

the original articles in which English abstract texts are not included. Although the translated texts need to be pre-edited and post-edited, labor cost is 20 percent to 30 percent lower than that of manual translation.

The proportion of Japanese journal articles which include author-written English abstract texts has been increasing steadily. In 1992, they amounted to more than 40 percent. This increase might be owed to JICST's effort to make and distribute the SISTs (Standards for Information on Science and Technology) under the supervision of the Science and Technology Agency.

There are 13 series of SIST. SIST 07 defines the constitution of scientific periodicals and SIST 08 defines the constitution of scientific papers. In these two standards, there are items which specify that a scientific paper written in Japanese should include a title and an abstract written in "a mostly universal language."

In 1990, a new JICST bibliographic database, JQUICK, started to be constructed and provided online. JQUICK includes all bibliographic items which are input before abstracting and indexing are conducted. If English abstract texts and English titles are included in original articles written in the Japanese language, they are also inputed into the database at this stage.

Because more than 40 percent of Japanese-language articles include English abstract texts, you can obtain Japanese STI much earlier by accessing JQUICK, although it is not comprehensive. JQUICK also contains citations not included in the other JICST databases. In 1991 updates, for example, there are about 230,000 citations of this sort. Of those citations, documents published in Japan are mostly comprised of preprints of scientific and technical meetings.

Figure 1 shows the interrelationship among the bibliographic citations covered by the four JICST databases.

Figure 2 shows the characteristics of the JICST collection as broken down by publishing countries. Over half of the journals collected (from more than 50 countries) are published in Japan. The JICST's collection includes a lot of so-called "grey" literature of Japanese origin. These include research reports published by the Japanese government, the local government, public research institutes, and universities, or tech-

nical reports (so called "Giho") published by private enterprises. The JICST databases, reflecting the JICST policy to put special emphasis on Japanese STI, have highly attracted users' attention even in Japan. The following are some characteristics of the JICST database citations, excluding the JAMAS portion of JMEDICINE, as analyzed by the 1991 updates.

Figure 3 shows the number of citations included in each subject field. In the JICST classification table, scientific and technical fields are divided into 24 subject categories (Table 1) and these categories are used to break down the data by subject fields.

In Figure 3, each column is divided in half to show the share of citations originating from domestic documents and those from foreign source documents.

The reason that the proportion of domestic documents is especially high in Medicine is that JICST does not collect and process foreign source documents related to clinical medicine.

Figure 4 shows the proportion of citations as broken down by publishing country.

Figure 5 shows the proportion of citations as broken down by original language.

Figure 6 shows the percentages of foreign-language articles and abstract-containing citations in JICST-E as broken down by subject fields.

Future Prospects

Information on the advancement of science and technology greatly encourages the research and development of more advanced technologies. Accordingly, demands for obtaining accurate information quickly will never decline. As a database producer, JICST will have to make every effort to respond to these demands by improving the quality of its databases.

Quality control of bibliographic databases is a long-standing critical issue for database producers. Subject analysis of a document is the most important, yet the most labor-intensive, job in database production.

In order to keep indexing consistency at a high level, the implementation of an expert system in the indexing process should be effective. JICST has been developing a computer-assisted abstracting and indexing system, with expectations that it will improve database quality.

The enhancement of JICST-E is also one of our major tasks. The first step is to increase the number of citations with English abstracts. The next step is to increase the coverage of Japanese documents. JICST is considering merging the JAMAS portion of JMEDICINE into JICST-E. Japanese documents covered only by JQUICK are also to be included in JICST-E. The third task is to shorten the time-lag of database production. To accomplish this, JICST first plans to create a database, JICST-E Preview, that is comprised of citations with author-written, English titles. Citations in this database will be provided online about two or three months earlier than when these citations are ordinarily augmented by index terms and classification codes, and transferred into JICST-E.

To make scientists and technologists as well as information intermediaries aware of Japanese STI, JICST will continue to make various promotional campaigns by holding meetings, such as this JICST/NTIS conference, or by distributing our information products as widely as possible.

This spring, JICST successfully conducted an experiment to access JOIS (JICST Online Information System) from Thailand through an experimental satellite operated by NASDA (National Space Development Agency of Japan). This test was conducted as a part of the PARTNERS Project (Pan-Pacific Regional Telecommunications Network Experiments and Research Satellite), a joint project between NASDA and the Ministry of Posts and Telecommunications. The purpose of the project is to explore the simple satellite communication's possibilities to promote Asia-Pacific regional cooperation in education, medical services, technology transfer, and so on.

Publication of an English version of the *White Paper on Science and Technology* is also one of our efforts to distribute Japanese information worldwide. This report presents the overall landscape of the Japanese scientific and technological activities and has been welcome by our customers overseas.

The rapid development of higher information and communications technology urges database producers to diversify their information products. In JICST, various attempts have been made to develop new products. Ms. Sone, in her paper, describes one of these attempts. JICST will make every effort to improve and to diversify its information products, taking the customers' needs into consideration. Your ideas and comments will be highly appreciated.

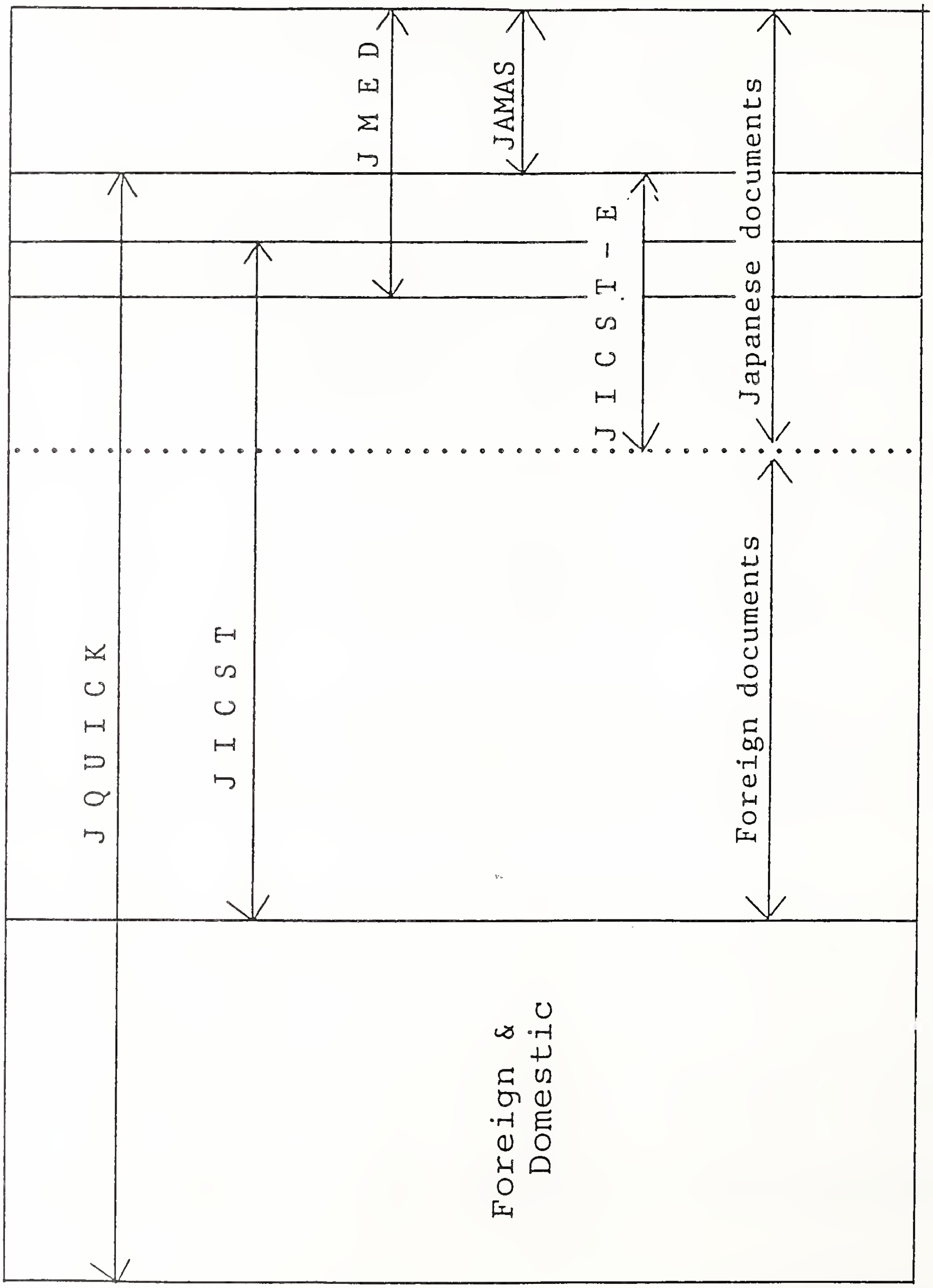


Fig. 1 Interrelationship among the JICST Databases

Fig. 2 Publishing Countries of JICST Collection

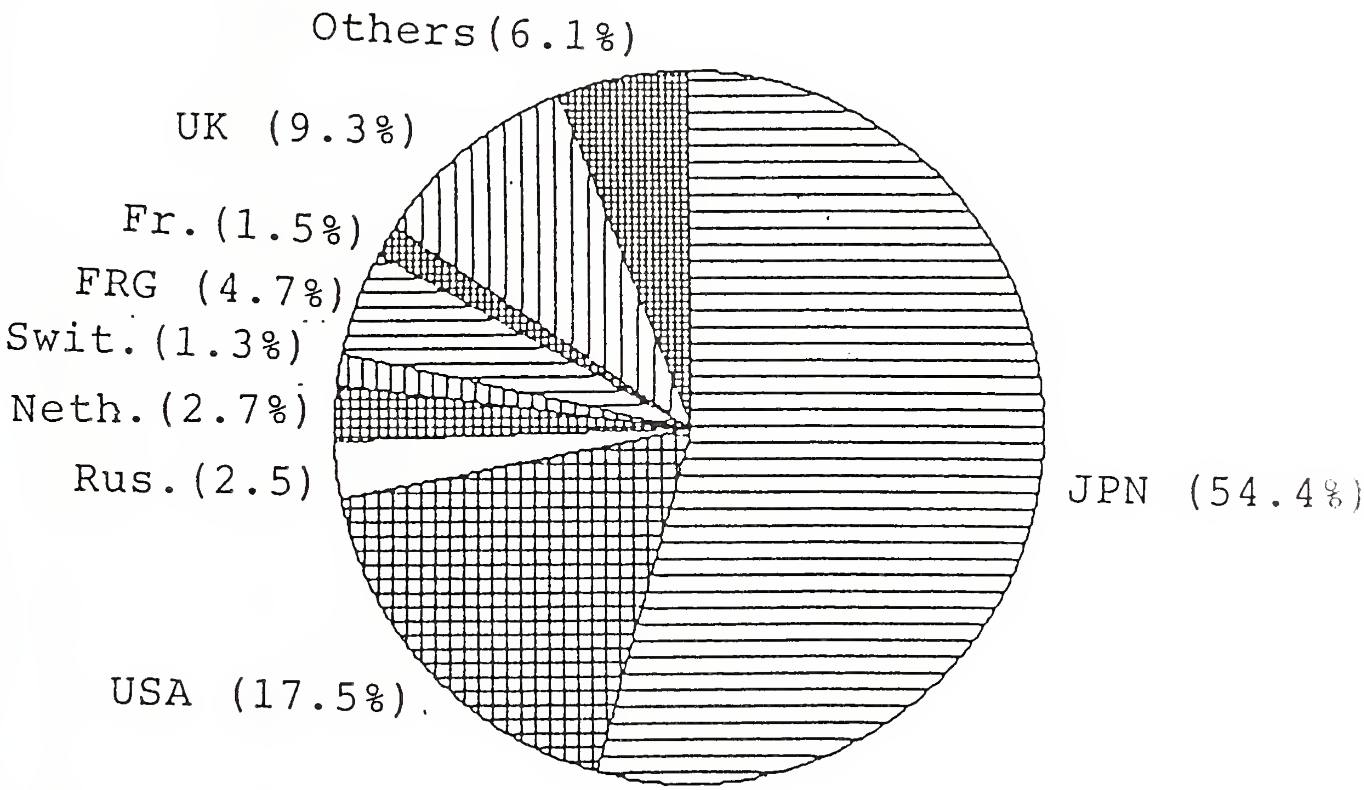
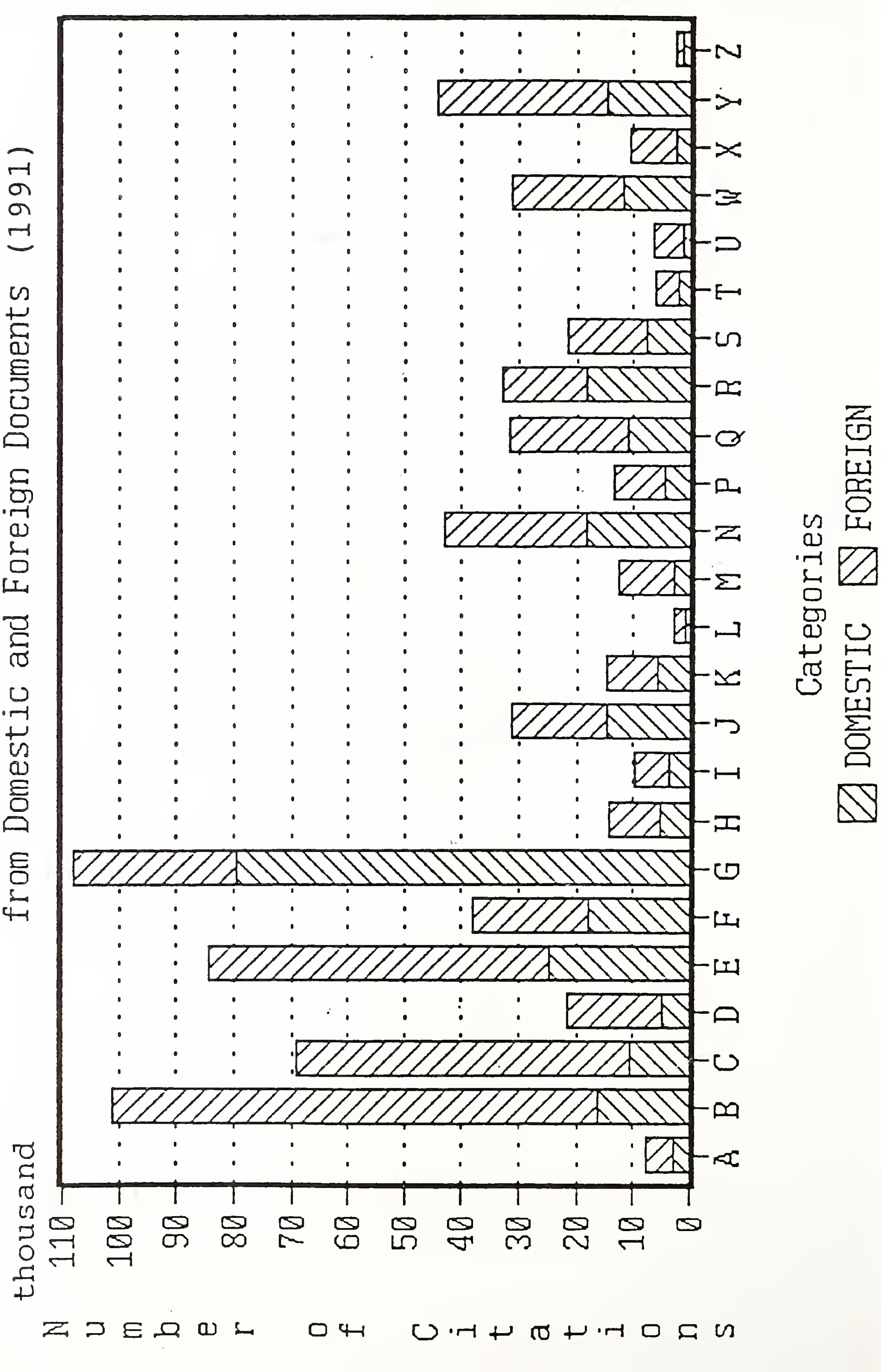


Fig.3 Number of Citations
from Domestic and Foreign Documents (1991)



JICST Classification

A	Science and Technology in General
B	Physics
C	Chemistry
D	Space Science and Earch Science
E	Biological Sciences
F	Agriculture, Forestry and Fisheries
G	Medicine
H	Engineering in General
I	System and Control Engineering
J	Information Engineering
K	Management Engineering
L	Energy Engineering
M	Nuclear Engineering
N	Electrical Engineering
P	Thermal Engineering. Applied thermodynamics
Q	Mechanical Engineering
R	Construction Engineering
S	Environmental Engineering
T	Transport and Traffic Engineering
U	Mining Engineering
W	Metallurgical Engineering
X	Chemical Engineering
Y	Chemical Industry
Z	Miscellaneous Industries

Fig. 4 Country of Publication

Number of Citations (91)

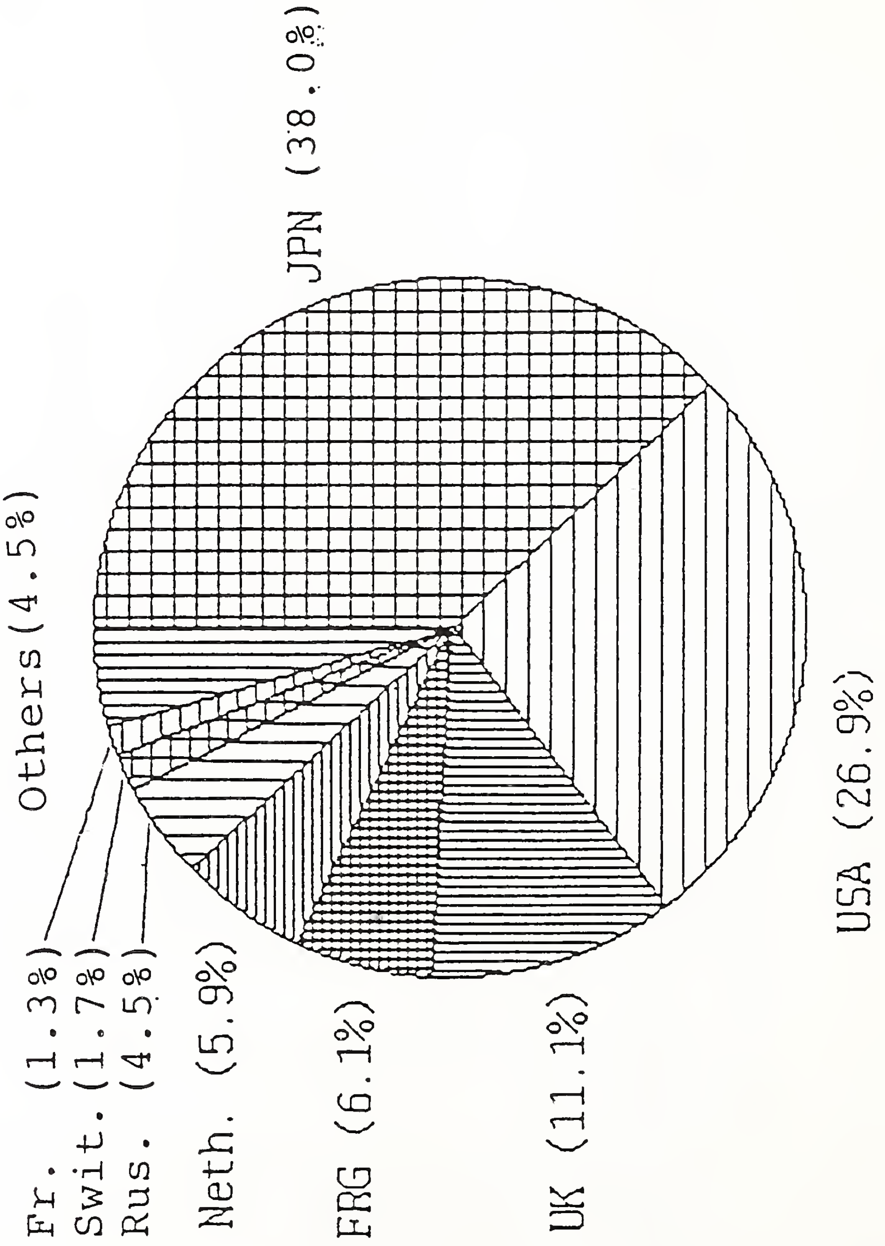


Fig. 5 Language of Publication

Number of Citations (91)

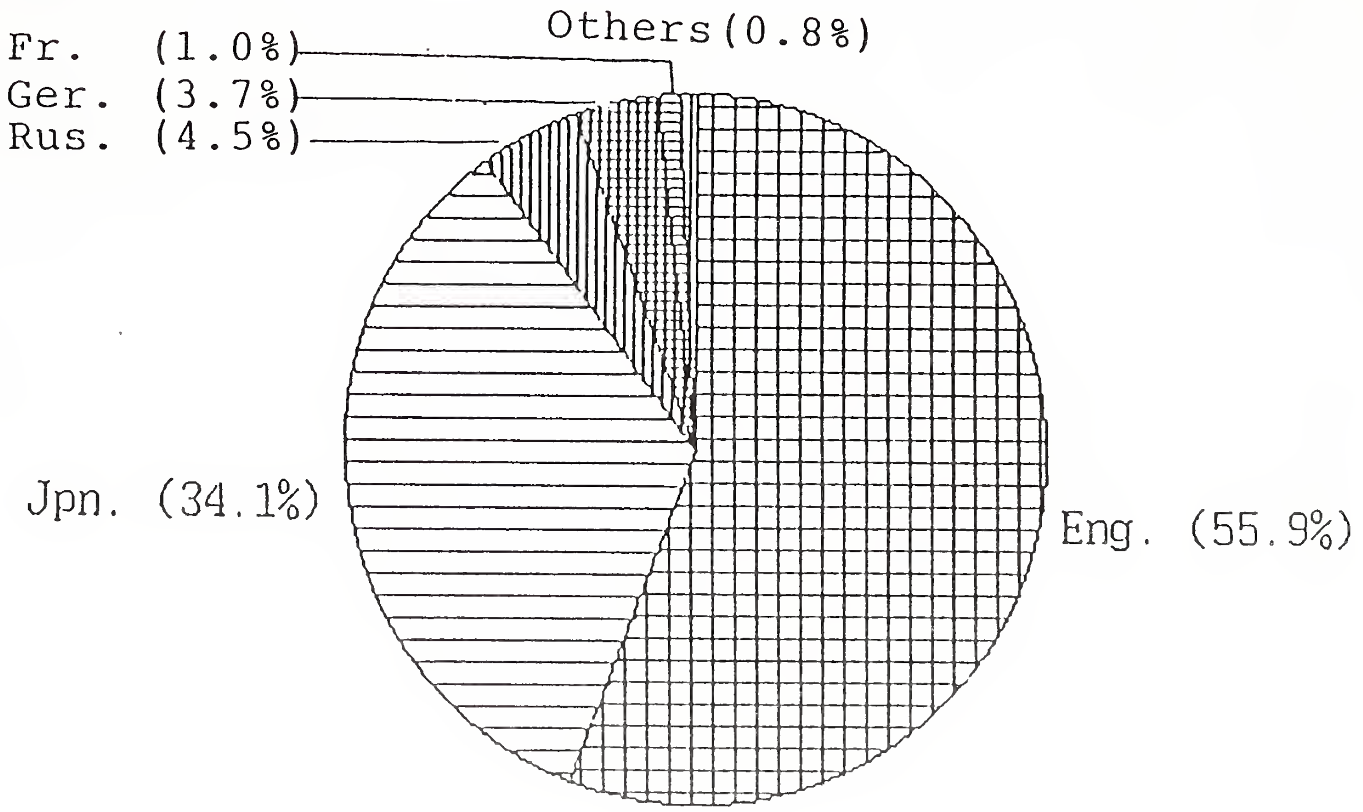
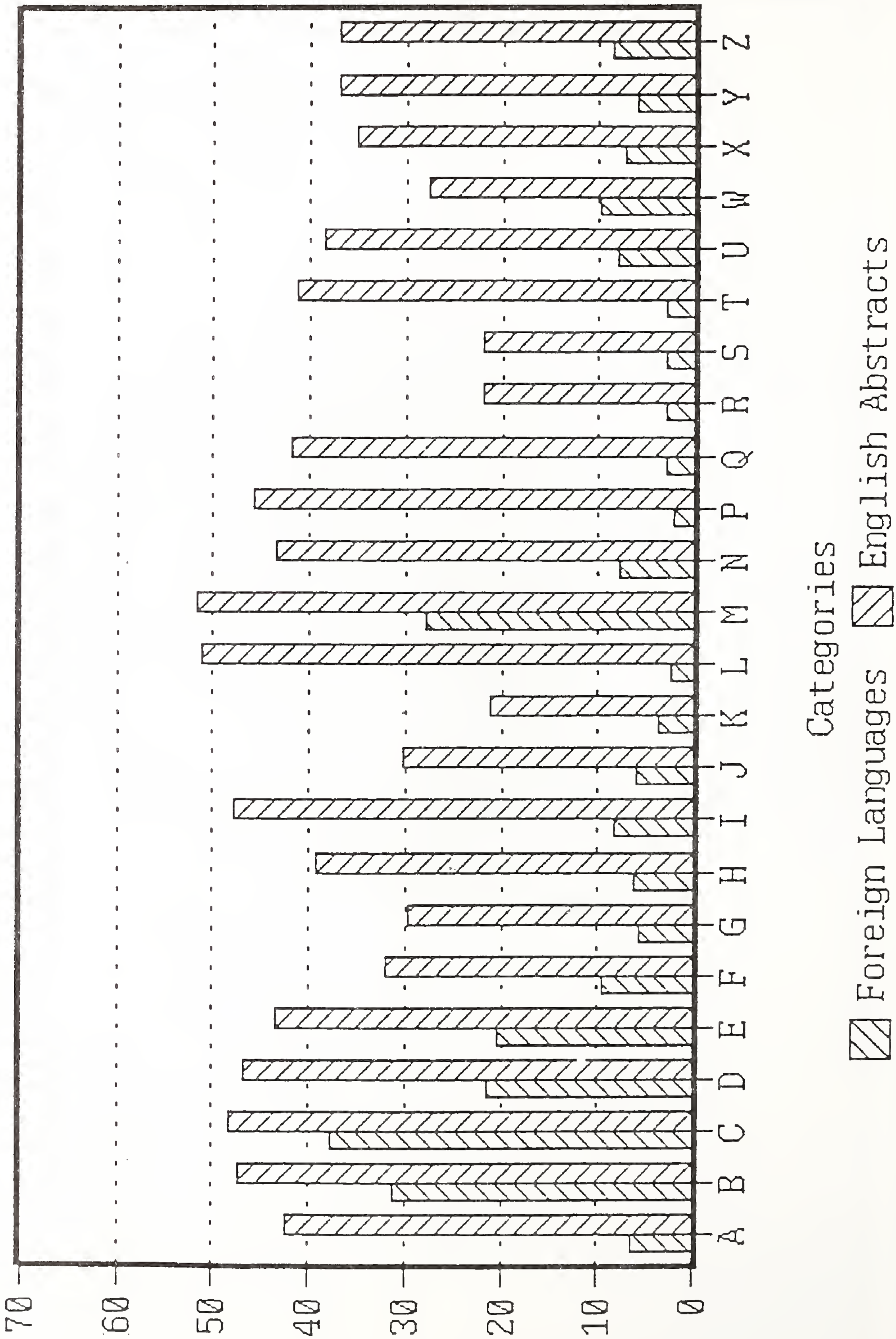


Fig. 6 Ratio of Foreign-Language Articles and Abstr.-Containing Citations in JICST-E (1991)



R&D Trends of Major Japanese Companies as a Result of Bibliometric Analysis of JICST Database

Ms. Yukiko Sone, Deputy Information Manager, Product Development Division, Technology Research & Development Department, Japan Information Center of Science and Technology (JICST)

It is said that the R&D activities in Japanese private companies are predominant over those of government or academic institutions, both in the expenditures and in the variety of themes. According to the statistical data, R&D expenditures in Japanese private companies amounted to more than ¥8.2 trillion in 1989 and represented a 70 percent share of the total amount of R&D expenditures in Japan. Research fields have expanded rapidly as a result of diversification of private enterprises' business.

Results of these research activities are mostly published in S&T publications and covered by the JICST File on Science and Technology (hereinafter, the JICST File).

As an attempt to explore the potential of the JICST File as a more useful data source, a bibliometric analysis was conducted to examine macro-trends of R&D activities of major companies in Japan. Citations of the JICST file, which is the largest bibliographic database in Japan covering almost all fields of science and technology, were unanalyzed.

Three questions were asked

- In which fields R&D activities are conducted
- Which companies and institutions cooperatively conducted R&D activities
- Who are carrying out the R&D activities in these companies

Method of Analysis

For this analysis, 150 private companies covering 21 industries, were selected which ranked high in accumulated numbers of contributed articles in the JICST File over the last decade. Citations of articles authored by the above-mentioned companies were retrieved from the JICST File updated in fiscal 1991 (from April 1991 to March 1992) through JOIS. The search queries were formulated by taking into account the different forms of a company's name in order to avoid false drops and misses. As a result, 38,337 citations of articles were obtained.

From each citation, the following factors were used for a statistical analysis of each company "Citation number," "JICST classification code," "author's name," and "author affiliation." This analysis included

- analysis of research fields conducted using the JICST classification codes which represent 154 S&T fields
- analysis of collaborative institutions (conducted using author affiliations)
- analysis of researchers (conducted using author's names affiliated with a selected company)

Analysis of Research Fields in a Company

For the analysis of research fields, a method for displaying the "Interrelationship among research fields" was designed. **Figure 1** represents an example of the display method. In this figure, the size of each circle shows the number of citations in a research field, which corresponds to a JICST classification code. Each citation in the JICST File contains one or more classification codes assigned by an indexer according to its subject content. It is assumed that these codes show the subject fields of the research reported in each article.

The number of occurrences of each classification code assigned to all citations by a selected company was counted. The field having the greatest number of citations is regarded as the main research field and positioned in the central circle. Its diameter is constant regardless of the number of citations. On a concentric circle surrounding the central one, the circles of the second and lower ranked fields were arranged

counterclockwise in alphabetical order by classification codes. Their diameters were determined in proportion to the number of citations in the main research field.

In the case where an article covers plural subject fields, more than one classification is assigned to the citation. In the indexing in JICST, an indexer judges the significance of the subject fields and decides the order of coding. Based on this, we regard the classification code to be the main classification and the others to be sub-classification codes. The main code and each sub-code in the citation are paired. For example, three classification codes, GY, GW, CF are assigned to a citation in this order. In this case, pairs GY-GW and GY-CF are generated. These pairs represent the correlation among the article's subjects and this correlation is shown with an arrow line connecting two circles of the fields.

The number of occurrences of each pair obtained from all citations by a selected company was counted. **Table 1** is a ranking list of the pairs obtained from all citations by the same company shown in **Figure 1**, and shows how they correspond to arrow lines drawn in **Figure 1**. The kind of the arrow line is determined by the rate of frequency of the pair. A pair with a higher ranking is shown by a solid line and a pair with a lower ranking by a broken line. Each arrow is headed from the sub-fields to the main field.

From these diagrams, the following points can be made clear:

1) Main research fields indicated by the combination of the size of circles and the density of arrowheads.

2) Research themes related to two fields connected by the arrow line.

In comparison with the usually employed graphic display methods such as a pie chart, this diagram can show more visually and clearly the features in research fields of a company and thus it can be used to compare the company's research fields with those of other companies in the same industry and to examine the transition over the years of the research fields in the same company.

Figure 2 is the example of another chemical company. As these two (**Figure 1 and Figure 2**) are representative chemical companies in Japan, the difference between the major R&D fields of the two companies can be seen clearly.

Analysis of Research Fields in an Industry

By summing the data of the companies in an industry, it is possible to draw up an "interrelationship among research fields" in the industry. Since the 150 Japanese companies selected are leading companies representing each industry, major industrial trends in Japan can be disclosed by this analysis. **Figure 3** shows a correlation map of research fields in the automobile industry in 1991. From this map, three major research fields of the industry can be identified. They are automobiles (performance and design, etc.), heat engines, and metal working technologies.

If these maps were made consecutively for a couple of years, the trends in an industry could be monitored more clearly. **Figure 4** depicts, by year, the number of articles for each of the three major research fields. It shows that in the automobile industry, changes in the major research fields have taken place over the last five years.

Analysis of Collaborative Institutions

When a paper is co-authored, it suggests that a kind of joint research has been conducted. There may be a great variety in the type of collaborations, but it can be roughly divided into collaboration within the same organization and that between different organizations. When an article by an author affiliated with a selected company was co-authored by an author affiliated with another organization, the organization's name was extracted under the name of "co-author institution." For each company, co-author institutions were ranked in order of their occurrences. The co-author institutions were classified into four categories and the number of different co-author institutions were counted in each category.

This allowed us to analyze to what extent the company collaborates with other institutions and what kinds of institutions are selected as partners. **Figure 5** shows the number of collaborative institutions of each electrical machinery company and the share as broken down by the four categories.

Analysis of Researchers

Author's names affiliated with a selected company were ranked in order of their occurrences. The author with a higher ranking is presumed to be a key person in R&D activities of the company. A matrix was made to show the correlation between authors rankings and the major research fields. However, JICST File author's names are expressed either in "*kanji*" or "*roman-ji*" (English expression) depending on the language of the original article and that made difficult a complete aggregation in terms of a "researcher."

Evaluation

Synthesizing the results as mentioned above, the following points have become clear:

- Present status of R&D activities in each company can be seen to some extent
- The transition of R&D activities in each company can be monitored
- The characteristics of R&D activities of a company can be made clear by comparing it with those of other companies within an industry

It is said that there are 3 kinds of materials to be used for the evaluation of R&D activities of a company, that is, patents, products, and papers. Above all, patents have been given more attention to be used for this kind of analysis. However, technical papers include many pioneering research areas which may relate to industrial technologies applied by companies in the future. In this sense, the present analysis would give very useful data for understanding the potentials of R&D in Japanese companies.

FIGURE 1 MITSUBISHI KASEI CORP. (CHEMISTRY) 1991

INTERRELATIONSHIP AMONG RESEARCH FIELDS

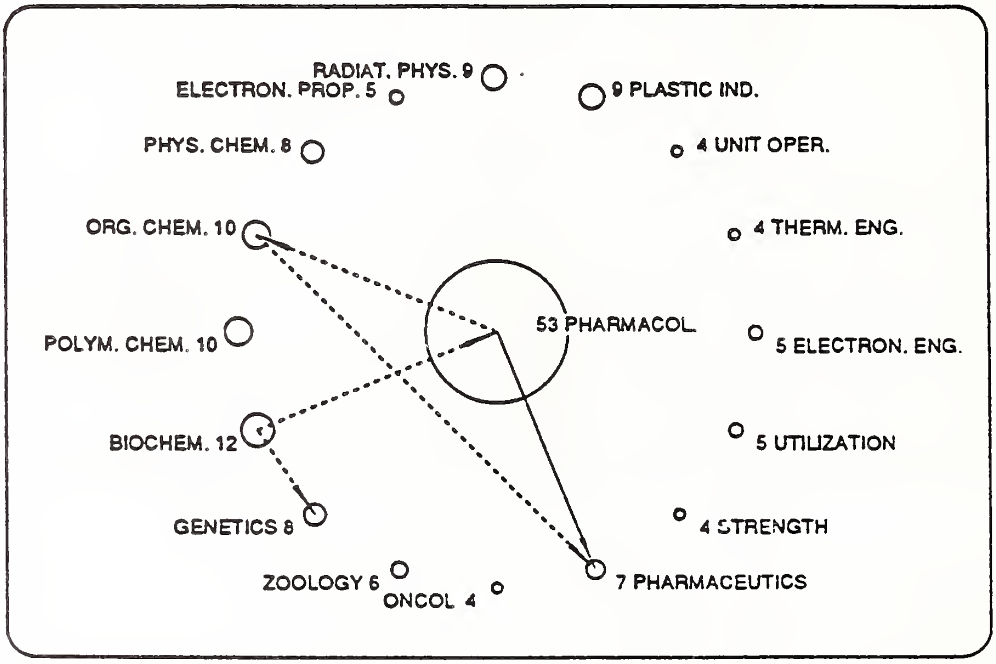


TABLE 1 PAIRS, FREQUENCIES AND ARROW LINES

PAIR	FREQ.	ARROW LINE		
GY-GW	5	PHARMACEUTICS	◄——	PHARMACOLOGY
GY-CF	2	PHARMACEUTICS	◄·······	ORGANIC CHEMISTRY
EC-EB	2	GENETICS	◄········	BIOCHEMISTRY
CF-GW	2	ORGANIC CHEMISTRY	◄···	PHARMACOLOGY
GW-EB	2	PHARMACOLOGY	◄········	BIOCHEMISTRY

*JICST CLASSIFICATION CODES AND THEIR FIELDS IN TABLE 1

CF: ORGANIC CHEMISTRY   EB: BIOCHEMISTRY

EC: GENETICS   GY: PHARMACEUTICS

GW: PHARMACOLOGY

FIGURE 2 SUMITOMO CHEMICAL CO., LTD. (CHEMISTRY) 1991

INTERRELATIONSHIP AMONG RESEARCH FIELDS

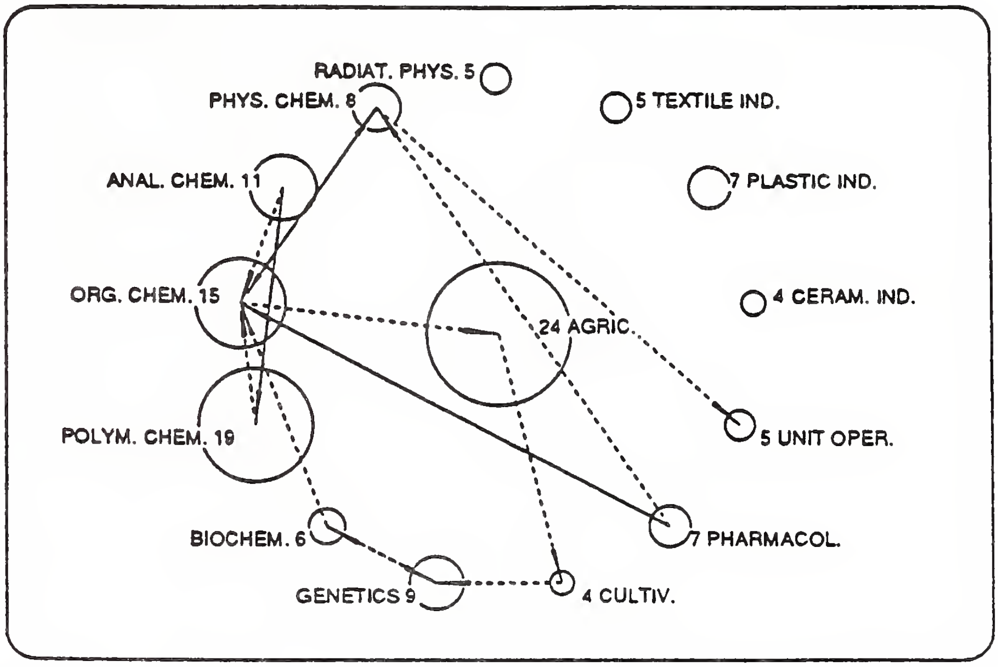


FIGURE 3 AUTOMOBILE INDUSTRY 1991

INTERRELATIONSHIP AMONG RESEARCH FIELDS

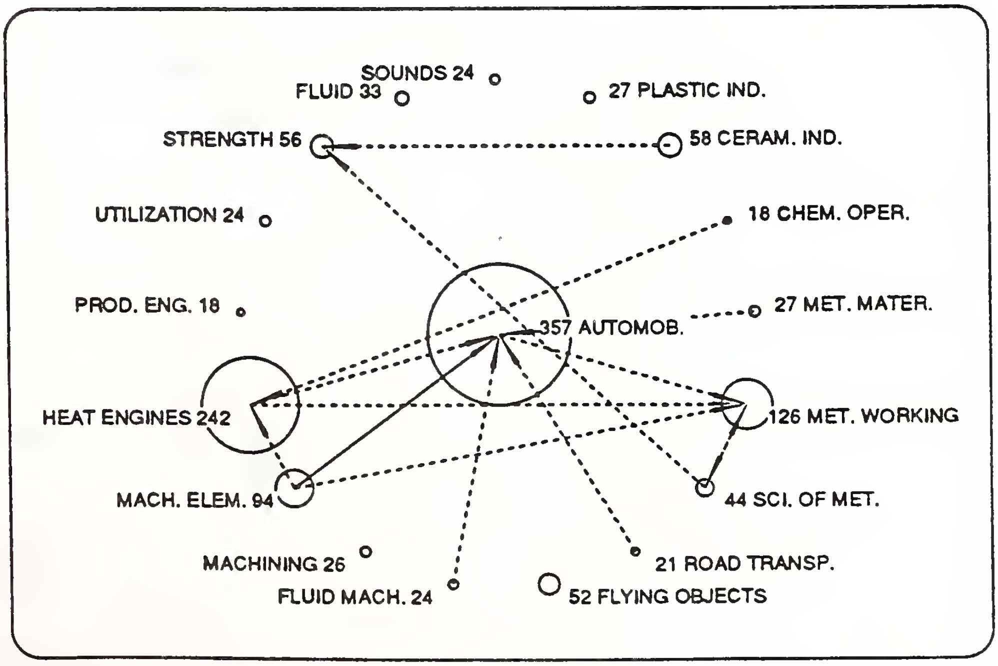


FIGURE 4 MAJOR RESEARCH FIELDS IN AUTOMOBILE INDUSTRY

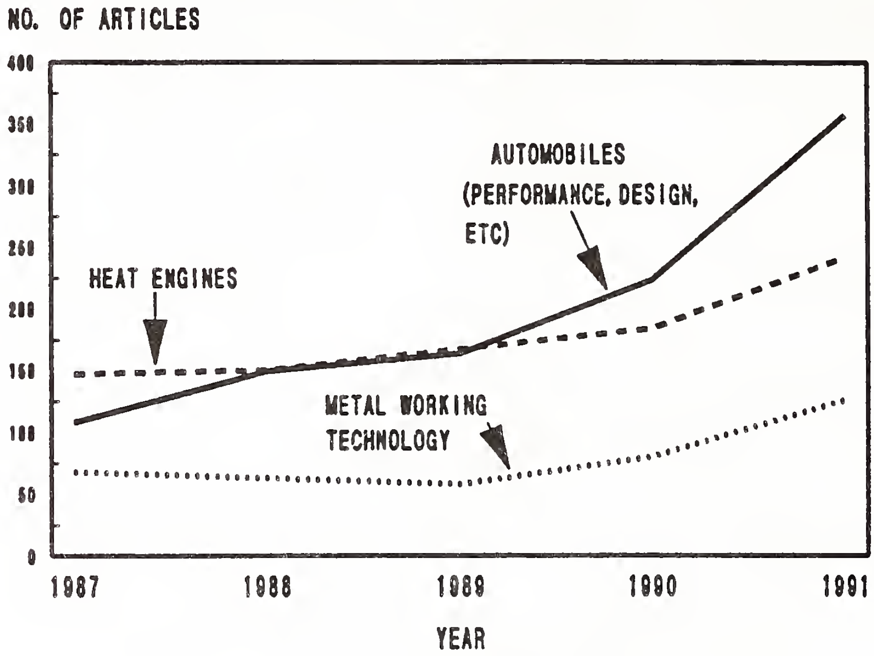
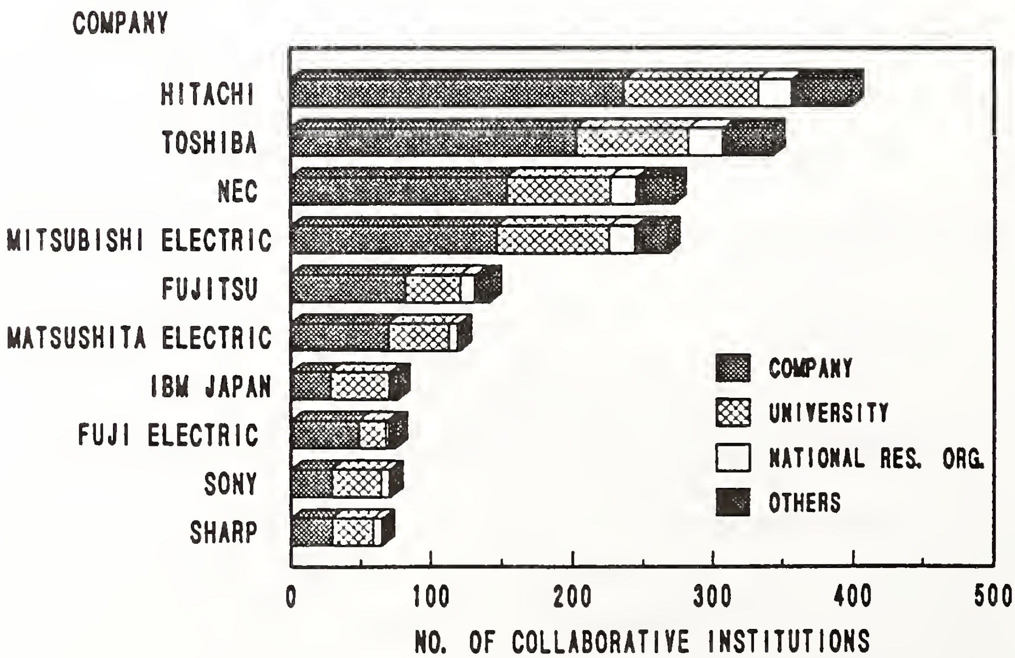


FIGURE 5 COLLABORATIVE INSTITUTIONS

(ELECTRICAL MACHINERY INDUSTRY)



Access to Japanese Aerospace-Related Scientific and Technical Information: The NASA Aerospace Database

Mr. Glenn P. Hoetker, International STI Program Analyst, NASA STI Program and Mr. Thomas F. Lahr, Manager, International Programs, NASA STI Program

With Japan's growing R&D strength in aerospace-related fields, it is increasingly important for U.S. researchers to be aware of Japanese advances. Although aerospace is a field in which the United States is widely regarded as a technological leader, Japan has become an increasingly more important source of aerospace research and development (O'Toole, 1992). However, several factors make is difficult to do so. After reviewing the diffusion of aerospace STI in Japan, four factors which make it difficult for U.S. researchers to gather this information are discussed: language, the human network, information scatter, and document acquisition. NASA has initiated a number of activities to alleviate these difficulties.

Aerospace STI Diffusion in Japan

A widely scattered field

Unlike the United States, there is no central organization in Japan with responsibility for aerospace scientific and technical information (STI). In order to understand why not, it is helpful to examine STI in general and aerospace research in Japan specifically.

Although Japan is well-known for its collaborative research between companies, there is little collaboration between universities and industry by American standards. Industry views the universities as a source of well-educated workers, not high-quality research (Nishi and Kobayashi, 1993). As a result, there is low demand from industry for information on university research.

Informal methods such as university professors consulting for industry, which is technically illegal but common (Dearing, 1989), and industry lecturers at universities (Nishi and Kobayashi, 1993) help provide much of the information flow needed. It should be noted that there has been a marked increase in university/industry joint research and technology transfer in recent years (Levy and Samuels, 1989).

The Japanese aerospace industry is very concentrated, with three firms controlling ninety-six percent of all prime contracting. Extensive vertical integration within companies and *keiretsu* (corporate groupings) further emphasizes this concentration (Levy and Samuels, 1989). Along with a long history of collaborative research between companies, this reduces the need for a formal, centralized mechanism for STI dissemination between companies.

Japanese national government administration is very vertically fragmented. This sectional centralization (*tatewari gyosei*) inhibits coordinated activity in research administration, including STI dissemination. There has historically been fierce rivalry between the Ministry of Education, Science and Culture (MESC), the Ministry of Post and Telecommunications (MPT), the Ministry for International Trade and Industry (MITI) and the Science and Technology Agency of the Prime Minister's Office (STA) (Levy and Samuels, 1989). As a result, STI dissemination activities by the various ministries focus on the research institutions under that ministry's jurisdiction, rather than being comprehensive (Dearing, 1989). The effect of this fragmentation is heightened because of the strong central control exerted by the ministries on various research organizations, such as MESC's oversight of the national universities and many of the national research laboratories.

Expectations for information dissemination within organizations are also quite different than in the U.S. National research laboratories consider the publication of research reports to be their mandated responsibility and not an appropriate business for the private sector. However, the national institutes are constantly struggling with budgetary limitations, which encourages dissemination of reports only to related institutions and researchers.

To summarize, aerospace research and corresponding STI activity is highly segmented in Japan. As a result, no central organization is responsible for aerospace STI in all sectors of the research community.

The Players in Aerospace STI: JICST, NACSIS, and NASDA

Two national organizations, the Japan Information Center of Science and Technology and the National Center for Science Information System, have major responsibility for the gathering and dissemination information within their jurisdictions.

In 1957, the Science and Technology Agency founded, with government and industry funding, the Japan Information Center of Science and Technology (JICST) to collect and process worldwide STI, disseminate that information throughout Japan, and encourage scientific documentation activity within Japanese organizations. In 1969, the Science and Technology Council of the Prime Minister's Office issued a report proposing a National Information System for Science and Technology (NIST). Several years later the Standing Committee for Information in Science and Technology revised and redefined NIST, stressing computerization and an expanded role for JICST. In 1974, a more concrete NIST plan was put forward.

JICST, which is a Public Corporation under the Science and Technology Agency, is active in constructing bibliographic databases, applying machine translation to STI, and international information activities such as constructing English-language databases. It provides access to a variety of databases via JOIS, the JICST Online Information System. In FY 1992, it had a budget of ¥15.635 billion (approximately $130,291,666) (Science and Technology Agency, 1992).

JICST's main database covers journal articles and publicly available technical papers. It includes aerospace STI, although aerospace is not a specific focus of the database. The Japanese version of JOIS is accessible via the National Technical Information Service, and the English-version of JICST, JICST-E, is available via the STN information service.

In 1980, the Ministry for Education, Science and Culture issued a report calling for a separate science information system for the national universities and research labs (Congressional Research Service, 1984).

This organization, the National Center for Science Information System (NACSIS), was formed as a National Inter-University Research Institution in 1987.

NACSIS has responsibility for the STI activities of the national universities and national research laboratories under the control of the Ministry of Education, Science and Culture. In FY 1992, it had an overall budget of 2.54 billion yen ($21.2 million) with 117.7 million yen ($980,000) earmarked for the creation of databases at national universities.

Databases produced by NACSIS cover technical papers, theses, and dissertations from the universities, including those not provided to the public. This includes aerospace material from laboratories affiliated with universities, such as the Institute of Space and Aeronautical Science. The NACSIS database system can currently be accessed in the United States at the Library of Congress and at the National Science Foundation.

The National Space Development Agency (NASDA) of Japan, a public corporation under the STA, plays an important, but not central, role in aerospace STI. NASDA is in charge of satellite and launch vehicle development, and is fundamentally an engineering institution, not a research organization. Unlike NASA, NASDA founding legislation does not assign it the responsibility of disseminating information.

NASDA is developing the Aerospace Information Reference System (AIRS), which could potentially become the central aerospace STI source for Japan. It is currently an experimental system for NASDA's internal use. It covers aerospace technical reports from the National Aerospace Laboratory, Communications Research Laboratory, and NASDA itself.

The various national laboratories have developed a variety of database systems for internal use, but there is no common system yet. The labs do send their reports to the National Diet Library (NDL). However, NDL does not have responsibility for disseminating those reports.

Gathering Japanese Aerospace STI in the United States

For the reasons discussed above, even Japanese researchers sometimes have difficulty obtaining Japanese aerospace STI. American researchers find it even more troublesome. There are four special difficulties Americans face when attempting to gather Japanese STI.

Language

An obvious difficulty is language. Few U.S. researchers read Japanese and there is an extreme shortage of qualified technical translators from Japanese to English. As a result, translating articles is expensive and time-consuming.

Less obviously, the language barrier makes it more difficult even to identify useful Japanese materials. Because of translation costs, few databases cover Japanese materials in as timely or comprehensive fashion as they do materials in English or European languages. As a result, it is difficult even to identify documents worth translating.

English-language reporting of Japanese R&D is often helpful in pointing out important topics. However, often there is a loss of clarity, timeliness, and detail. Therefore, English-language reporting is at best a partial substitute for access to the original Japanese-language material.

The Human Network

Even more so than in other countries, the flow of information through the "invisible college" of human contacts is a vital part of scientific communication in Japan. Because of language and cultural difficulties, few Americans are part of this network. Moreover, few Americans have spent sufficient time in Japan to make the necessary connections to take advantage of this information flow.

It should be noted, however, that this problem, while severe, is often overstated. Access to published material can provide much more complete information than is commonly realized.

Information Scatter

One effect of no national government organization having overall responsibility for aerospace STI is a scattering of aerospace STI. Further scattering is caused by the nature of scientific publishing and the database industry within Japan. Japan has few refereed journals compared to the U.S. and most Japanese researchers publish domestically in their university, society, or company publications. This makes it difficult to identify a core group of journals for aerospace-related technologies.

This scatter extends into databases, of which Japan has many. There is no Japanese equivalent to DIALOG or Orbit, offering access to a large number of databases across a range of subjects. Therefore, a researcher must identify databases individually, make subscription arrangements with each, and learn a specific search command language for each. While more databases are becoming available through international telecommunication networks, different arrangements may be necessary to connect to each database. In addition to the administrative costs involved, there may be minimum monthly fees for each database. In sum, access to a range of Japanese databases is much more time-consuming and costly than in the U.S.

Document Acquisition

Once an relevant item has been identified, it may still be very difficult to obtain. Holdings of Japanese journals and reports in American libraries are sparse and few American librarians are familiar with alternative sources of Japanese documents. Until this is rectified, it will be difficult to obtain even fairly common publications.

NASA Activities to Address These Problems

In order to understand NASA's activities to address these problems, it is useful to understand the context in which they take place. The Space Act of 1958 gave NASA two STI-related goals: "To provide for the widest appropriate dissemination of the results of NASA research and development" and "To preserve the role of the United States as a leader in aeronautical and space science technology by acquiring world-wide STI and disseminating it in the U.S."

One of the most important tools the NASA STI Program uses to achieve these goals is the *NASA Aerospace Database*. The *NASA Aerospace Database* is the world's most comprehensive bibliographic database of aerospace-related STI, containing over 2 million records from 1962 to the present. Over 70,000 records are added each year from NASA researchers, NASA contractors, other government agencies, published literature, and international partners. Because of the breadth of science and technology involved in NASA programs, the database covers not only obvious fields such as aircraft instrumentation and aerospace medicine, but also fields such as environmental pollution and solid-state physics. Documents cited in the database include technical reports, journal articles, conference proceedings and others. The database is available via NASA's RECON system, DIALOG Information Services, and several printed versions.

The NASA STI Program gathers material from foreign institutions through several means. The most basic is a "bilateral agreement." Under a bilateral agreement between the NASA STI Program and a foreign STI-producing institution, the two institutions exchange copies of their technical documents. The NASA Center for AeroSpace Information (CASI) produces abstracts and bibliographic citations for the documents and adds them to the *NASA Aerospace Database*.

The NASA STI Program has bilateral agreements with 29 Japanese institutions, including government agencies, private companies, and universities. These agreements have been very productive, with over 58,000 Japanese documents included in the Database. Some of the organizations and journals from which input has been received are listed below.

Organizations

Universities

Chiba University
Hiroshima University
Kyoto University
Nagoya University
Osaka University
Tohoku University
Tokyo Institute Of Technology
Tokyo University, (Institute of Space and Astronautical Science)

Government

Communications Research Laboratory
Japan Atomic Energy Research Institute
National Aerospace Laboratory
National Space Development Agency
New Energy Development Organization

Industry

Fuji Heavy Industries Ltd.
Fujitsu Ltd.
Ishikawajima-Harima Heavy Industries
Mitsubishi Electric Corporation
Nippon Electric Co. Ltd.
Nissan Motor Co. Ltd.

Journals

Astronomical Society of Japan, Publications
Astronomical Society of The Pacific, Publications
Communications Research Laboratory Review
Ishikawajima-Harima Engineering Review
Japanese Journal of Applied Physics
Journal of the Japan Institute of Light Metals
Journal of the Japan Institute of Metals
Journal of the Japan Society For Aeronautical And Space Sciences
Journal of the Japan Society of Materials Science
Journal of the Meteorological Society of Japan
Journal of the Physical Society of Japan
JSME International Journal
Proceedings of the Research Institute of Atmospherics, Nagoya University
Transactions of the IEICE

In recent years, Japanese input to the database has increased, reaching over 4,000 items in 1992. Because of this, it became necessary to find a more efficient way to gather and process material from Japanese organizations.

Therefore, in November 1992, a National Level Technical Exchange Protocol or a "National Level Agreement" between NASA and the National Space Development Agency of Japan (NASDA) was finalized and signed, introducing a new level of international STI cooperation.

The agreement, modeled on other NASA National Level Agreements, is the culmination of two years of negotiation and consensus building by STI professionals in both agencies and is designed to be mutually beneficial to the aerospace communities of both countries.

The recently signed agreement with NASDA calls for a two-phased approach to full exchange status. NASDA will begin to gather aerospace-related technical documents from institutions throughout Japan, prepare English bibliographic citations in machine readable form, and send the documents and citations to NASA to become part of the NASA Aerospace Database. In the first phase of the agreement, NASA will send its technical reports to Japanese institutions in exchange for their material. NASDA will coordinate the distribution of the NASA reports. In the second phase of the relationship, participating Japanese institutions will be granted electronic access to the NASA Aerospace Database.

NASDA has sent periodic test-batches of citations since 1989 which have been reviewed and entered into the STI Database. NASA Center for AeroSpace Information (CASI) staff have analyzed this material and provided feedback to NASDA.

A key step in establishing this arrangement was taken in June of 1992 when NASA received guests from NASDA to discuss the most recent draft of the protocol. The parties made significant progress during their talks, witnessed by the completion of the arrangement by the end of the year.

A two-day workshop at CASI provided the Japanese visitors with an overview and tour of processing facilities and allowed for detailed discussion of cataloging, abstracting, and indexing of documents for input into the NASA Aerospace Database. Sessions between NASDA and CASI catalogers were particularly productive, helping to clarify many points of confusion, including those arising from linguistic and cultural differences. For instance, the participants discussed the differences between U.S. and Japanese corporate structures and how this affects cataloging practices for the NASA Aerospace Database. Both sides learned a great deal from direct discussion and exchange of professional expertise. Equally important, however, were the personal contacts which were made and will assist in the smooth functioning of the agreement.

The new agreement will help overcome each of the challenges discussed above in the following ways:

Language -- NASDA will provide English-language citations, including abstracts, of each document added to the database. Although it will still be necessary to translate some original documents, it will be much easier to identify articles worth translating.

Human network - Although it is primarily an engineering, rather than research, organization, NASDA is an important part of the Japanese aerospace research community. Therefore, it already possesses the important connections necessary to involve organizations effectively in the information exchange. For example, it has working arrangements with important laboratories such as Communications Research Laboratory and the Aeronautical Research Laboratory. Hopefully, the new agreement will encourage American researchers to begin building their own networks by making them more aware of their Japanese peers' research.

Information scatter - The agreement can do nothing to reduce the scatter of research results in Japan. However, NASDA has the expertise to identify and gather key documents from throughout Japanese government agencies, universities, and private companies. Of course, all of these will be brought together in the *NASA Aerospace Database* greatly reducing information scatter for American researchers. Another consolidated source for information on Japanese research is the annual publication, *Japanese Aerospace Science and Technology (NASA Special Publication 7099).*

Document acquisition - By virtue of being in Japan, NASDA is more able to gather Japanese documents in a timely and cost-effective fashion. Additionally, it has the important institutional connections necessary to acquire documents not normally distributed to the general public.

The NASA STI International Program looks forward to future cooperation for the benefit not only of the U.S. and Japan, but the entire aerospace community, both international and domestic.

References

Congressional Research Service. (1984). *The Availability of Japanese Scientific and Technical Information in the United States.* Report prepared for the Subcommittee on Science, Research and Technology, 98th Congress, Second Session. Washington, DC: U.S. Government Printing Office.

Dearing, J. W. (1989). *How Japanese Scientists Talk to Each Other: Communication Networks in Tsukuba Science City.* Boston: MIT-Japan Program. Report MITJP 89-13.

Joint Publication Research Service, eds. (1992). *Science and Technology Japan: Science and Technology Budgets for Fiscal Year 1992.* Washington, DC: Joint Publications Research Service. Report JPRS-JST-92-093-L.

Levy, Jonah D. and Richard J. Samuels. (1989). *Institutions and Innovation: Research Collaboration as Technology Strategy in Japan.* Boston: MIT-Japan Program. Report MITJSTP 89-02.

Nishi, Yoshio and Hisashi Kobayashi. (1993). *A Comparison Between Japanese and American Technology Management.* Paper given at the American Association for the Advancement of Science annual meeting, Boston, MA., February 13.

O'Toole, Kevin. (1992, June 3). Sunrise Aerospace --- Technology Development in the Pacific Rim. *Flight International* 141 (4321), 23-25.

Science and Technology Agency, Japan. (1992). *STA 1992: Its Role and Activities. Tokyo: Science and Technology Agency.*

For more information on NASA STI Program services, contact the NASA Center for AeroSpace Information Access Help Desk at (301) 621-0390 or via electronic mail, help@casi.nasa.gov. Glenn Hoetker may be contacted directly at 703-685-1350 or ghoetker@sti.nasa.gov.

Part IV. How to Obtain and Use Japanese Patent Information

Japanese Patent Information on DIALOG

Dr. Lee Ann Gorthey, Dialog Information Services, Inc.

Patents are a very important source of technical and competitive information. Because many countries preclude patenting of material that has been otherwise disclosed, a large percentage of patents contain information that is not published elsewhere.

Dialog Information Services, Inc. provides access to a comprehensive collection of patent databases, in addition to hundreds of databases in other areas, such as company directories, market research reports, technical journals, and newspapers. Nearly every category includes databases with a global emphasis.

The Japanese Patent Office publishes two major kinds of patent documents: unexamined applications (*kokai*) and examined applications (*kokoku*). A few of the latter go on to the granted patent stage. Databases on DIALOG covers the first or first two stages of publication. Coverage and features vary from one database to another.

Derwent's World Patents Index (Dialog files 350,351) cover both stages of publication, with coverage of Japanese chemical patents from 1963 and Japanese electrical patents from 1982. Japanese patents in other technologies are not covered. The records feature enhanced titles for the electrical patents, and enhanced titles and informative abstracts for the chemical patents. Records also include family (equivalent) information from 30 other countries and issuing authorities, as well as detailed subject coding.

INPADOC/Family and Legal Status (Dialog file 345) also covers both stages of publication, with coverage of all technologies from April 1973. Family information from 55 other countries and issuing authorities is included, as well as legal status from 16 (not including Japan). Subject information is limited to titles and IPC (International Patent Classification) coding. INPADOC generally has a shorter time lag between publication and appearance online than the other databases discussed here.

JAPIO (Dialog file 347) is based on the printed *Patent Abstracts of Japan* and covers unexamined applications (examined not included) from late 1976. Most records for applications originating in Japan contain an English abstract. (Those from earlier years are less likely to contain an abstract.) IPC and JAPIO codes are also included. The time lag for this database is generally much longer than for INPADOC or Derwent WPI.

Other patent databases on DIALOG do not explicitly cover Japan but can offer important supplementary information, e.g., the text of a U.S. equivalent. These are the CLAIMS/U.S. Patent Abstracts database (Dialog files 125, 340), produced by IFI/Plenum, and the U.S. Patents/Fulltext database (Dialog files 652,653,654), based on USPTO tapes. Still others, such as the *BNA Daily News* (file 655) and PTS PROMT (file 16), offer information on newsworthy intellectual property-related events such as changes in patent law, licensing agreements, and litigation.

The DIALOG search software has many features that enhance cross-file searching, such as OneSearch (the capability to search in multiple databases simultaneously) and the MAP command (the ability to extract search terms from one database for use in another). For more information on Dialog services, contact Dialog Marketing at (800) 3-DIALOG.

The following presentation transparencies are examples of the above DIALOG files.

Sources of Japanese Patent Information on DIALOG:

Derwent World Patents Index (Files 351, 350)

Coverage:

- Chemical patents from 1963
- Electrical patents from 1982 (IPC Section H, some G)

- Kokai (unexamined applications)
- Kokoku (examined applications)
- PCT transfers to Japan

- Limited coverage of utility models

Features:

- Interpretative titles and abstracts
  (no abstracts for JP electrical)

- Patent family information from 31 issuing authorities

- Detailed indexing:
  - International Patent Classification
  - Derwent Classification
  - Subscriber coding:
    - Manual Codes
    - Chemical and Polymer Fragment Coding
    - Markush structure searching (coming soon on DIALOG)

Sources of Japanese Patent Information on DIALOG:

Derwent World Patents Index (contd.)

Currency:

Latest publication date as of March 12 1993: December 15, 1992

Costs:

	Std.	Subs.	JP Std.	JP Subs.
Connect hour:	198.00	119.00	208.00	125.00
Online type:	1.80	.80	1.90	.84

Sources of Japanese Patent Information on DIALOG:

INPADOC/Family and Legal Status (File 345)

Coverage:

- All technologies from April 1973

- Kokai (unexamined applications)
- Kokoku (examined applications)
- PCT transfers to Japan

- Limited coverage of utility models

Features:

- Family information from 56 issuing authorities

- Legal status information from 16 issuing authorities (Japan not included)

- International Patent Classes; National Classes

- Reference tags to Derwent WPI and JAPIO

Sources of Japanese Patent Information on DIALOG:

INPADOC/Family and Legal Status (contd.)

Currency:

- Latest publication date as of March 12 1993: January 22, 1993

Costs:

Connect hour:	132.00
Basic record:	.30
Country record:	5.00
Full family record:	20.00

Sources of Japanese Patent Information on DIALOG

JAPIO/Patent Abstracts of Japan (File 347)

Coverage:

- All technologies from October 1976
- Kokai (unexamined applications)

Features:

- English titles and abstracts
  (no abstracts for non-JP priority)
- International Patent Classification
- JAPIO Classification

Currency:

- Latest publication date as of March 12 1993: July 31, 1992

Costs:

Connect hour:	150.00
Bibliographic record:	.45
Full record:	.70

Sample Record from JAPIO: Patent Abstracts of Japan

DIALOG File 347

03691713
FOCUS DETECTOR

PUB. NO.:	4-056813 [JP 4056813 A]
PUBLISHED:	February 24, 1992 (19920224)
INVENTOR(s):	OTAKA KEIJI
APPLICANT(s):	CANON INC [000100] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.:	02-165142 [JP 90165142]
FILED:	June 22, 1990 (19900622)
INTL CLASS:	[5] G02B-007/34; G03B-013/36
JAPIO CLASS:	29.2 (PRECISION INSTRUMENTS -- Optical Equipment); 29.1 (PRECISION INSTRUMENTS -- Photography & Cinematography)
JOURNAL:	Section: P, Section No. 1365, Vol. 16, No. 247, Pg. 149, June 05, 1992 (19920605)

ABSTRACT

PURPOSE: To make a detecting means for detecting the position of a diaphragm unnecessary and to prevent focus detecting accuracy from being dropped due to the switching of the diaphragm by correcting and converting a sensor signal output by a parameter so as to correct the deviation of a diaphragm aperture from the normal position of its centroid position which is at the time of changing the aperture shape of the diaphragm.
CONSTITUTION: The focus detector is provided with a correcting/converting means 61 for correcting/converting a sensor signal output by a parameter related to the deviation of the aperture from the normal position of the centroid position which is generated when the aperture shape of the diaphragm is changed by a diaphragm control means, a correlation arithmetic means 62 for detecting a focus based upon a correction/conversion signal found out by the determined parameter and a parameter determining means 63. Thereby, the deviation of the aperture from the normal position of the centroid position which is generated when the aperture shape of the diaphragm is changed. Consequently, a new detecting means for detecting the position of the diaphragm is not required and focus detection accuracy can be prevented from being dropped due to the switching of the diaphragm.

Sources of Japanese Patent Information: INPADOC and JAPIO

? b 345

File 345:INPADOC/Family & Legal Status
UB=9301, UE=9301, UL=9301

? s pn=jp 4056813
S1 1 PN=JP 4056813

? s s1/eng
S2 0 S1/ENG <---- *no English equivalent*

? t s1/4,ti,dx <---- *low cost format; includes Derwent accession number if present*

1/4,TI,DX/1
Acc no: 10807212
Basic Patent (No,Kind,Date): JP 4056813 A2 920224
FOCUS DETECTOR (English)
FOCUS DETECTOR
Patent Assignee: CANON KK
Author (Inventor): OTAKA KEIJI
Priority (No,Kind,Date): JP 90165142 A 900622
Applic (No,Kind,Date): JP 90165142 A 900622
IPC: *G02B-007/34; G03B-013/36
JAPIO Reference No: 160247P000149
Language of Document: Japanese

```
? map an temp s1

1 Select Statement(s), 1 Search Term(s)
Serial#TC519


? b 347

File 347:JAPIO - Patent Abstracts of Japan   Oct/76 - July/92
          (c) JAPIO


? exs

Executing TC519
    S1      1  AN=JP 90165142


? t s1/9
```

00026813
FOCUS DETECTOR

PUB. NO.:	04-056813 {JP 4056813 A}
PUBLISHED:	February 24, 1992 (19920224)
INVENTOR(s):	OTAKA KEIJI
APPLICANT(s):	CANON INC {000100} (A Japanese Company or Corporation), JP (Japan)
APPL. NO.:	02-165142 {JP 90165142}
FILED:	June 22, 1990 (19900622)
INTL CLASS:	{5} G02B-007/34; G03B-013/36
JAPIO CLASS:	29.2 (PRECISION INSTRUMENTS -- Optical Equipment); 29.1(PRECISION INSTRUMENTS -- Photography & Cinematography)
JOURNAL:	Section: P, Section No. 1365, Vol. 16, No. 247, Pg. 149, June 05, 1992, (19920605)

ABSTRACT

PURPOSE: To make a detecting means for detecting the position of a diaphragm unnecessary and to prevent focus detecting accuracy from being dropped due to the switching of the diaphragm by correcting and converting a sensor signal output by a parameter so as to correct the deviation of a diaphragm aperture from the normal position of its centroid position which is at the time of changing the aperture shape of the diaphragm.

CONSTITUTION: The focus detector is provided with a correcting/ converting means 61 for correcting/converting a sensor signal output by a parameter related to the deviation of the aperture from the normal position of the centroid position which is generated when the aperture shape of the diaphragm is changed by a diaphragm control means, a correlation arithmetic means 62 for detecting a focus based upon a correction/conversion signal found out by the determined parameter and a parameter determining means 63. [etc.]

Sources of Japanese Patent Information: JAPIO, IFI CLAIMS, and Derwent World Patents Index

File 347: JAPIO - Patent Abstracts of Japan Oct/76 - July/92
(c) JAPIO

? s pn=jp 4042282
S1 1 PN=JP 4042282

? t s1/9

1/9/1
00012282
ELECTROPHOTOGRAPHIC PRINTER FOR CONTINUUM

PUB. NO.:	04-042282 {JP 4042282 A}
PUBLISHED:	February 12, 1992 (19920212)
INVENTOR(s):	SEODORE ZAJIYATSUKU JIYUNIAA
APPLICANT(s):	AUTOPUTSUTO TEKUNOROJII CORP{000000} (A Non-Japanese Company or Corporation), US (United States of America)
APPL. NO.:	02-303740 {JP 90303740}
FILED:	November 08, 1990 (19901108)
PRIORITY:	7-535,112 {US 535112-1990}, US (United States of America),June 08, 1990 (19900608)
INTL CLASS:	{5} G03G-015/20; B41J-002/41;B41J-011/42; G03G-015/00;G03G-015/00; G03G-015/20
JAPIO CLASS:	29.4 (PRECISION INSTRUMENTS -- Business Machines)
JAPIO KEYWORD:	R002 (LASERS); R116 (ELECTRONIC MATERIALS -- Light Emitting Diodes, LED)

? map an t <----- *maps all application numbers*

1 Select Statement(s), 3 Search Term(s)
Serial#TC531

? map anyy t <----- *maps only US NNNNNN-YYYY*

1 Select Statement(s), 1 Search Term(s)
Serial#TC532

? b 125,340

```
SYSTEM:OS  - DIALOG OneSearch
  File 125:CLAIMS/U.S. PATENT ABS WEEKLY
            PN 5175885-5185888      JAN 05 92-FEB 09 93
  File 340:CLAIMS/U.S. PATENT ABS
            PN 2492948-5175885      1950-DEC 92
```

? exs
Executing TC532

```
    S1      1  AN=US 535112-1990
```

? t s1/27

1/27/1 (Item 1 from file: 340)
2149671

United States Patent

Patent Number: US 5019872
Date of Patent: 910528

CONTINUOUS-FORM ELECTROPHOTOGRAPHIC PRINTER

Inventor(s): Zajac, Jr, Theodore, Spokane, WA, (US)
Assignee: Output Technology Corporation, Spokane, WA
Appl. No.: US 535112
Filed: 900608

Related U.S. Application Data

Priority Applic(Ser#,Date): US 535112 900608

Int. Cl. G03G-021/00;
U.S. Cl. 355317000; 226075000; 355274000; 355282000;
355311000
Field of Search.. 226074000; 226075000; 355203000;35520400C
355208000;355271000; 355274000; 35528200C
355308000;355309000; 355311000; 35531700C

References Cited

U.S. PATENT DOCUMENTS

Patent Number	Date YYYYMM	Class	Inventor
US 3987884	197610	226074000X	Buxton
US 4478508	198408	355317000	Kato et al.
US 4595279	198606	355282000	Kuru et al.
US 4607572	198608	355317000	Pou et al.

US 4609279	198609		ausmann et al.
US 4843429	198906	355274000	Avritt et al.
US 4844434	198907	355308000X	Acquaviva et al.
US 4870434	198908	346160000	Negishi et al.
US 4943863	199007	355271000	Ainoya

OTHER PUBLICATIONS

Laser Printer User's Guide, "Pentax Teknologies Laserfold 240", Pentax Teknologies Corporation, Broomfield, Colo., Rev. 05 (Jan. 30, 990).

Primary Examiner - Grimley, A T
Assistant Examiner - Dang, Thu A
Attorney, Agent or Firm - Wells, St John & Roberts

ABSTRACT

A preferred embodiment of this continuous-form electrophotographic printer as illustrated in the drawings having an image transfer device 38 positioned at the image transfer station for placing images on individual sheets 14 of a continuous-form 12. Downstream, a distance A, is a fixing device at an image fixing station 32 for fixing the image onto the individual sheet 14. The printer 10 [etc.]

020 Claims, 6 Drawing Figures, 4 Drawing Sheets

EXEMPLARY CLAIM

DRAWING

1. A continuous-form electrophotographic printer for printing a continuous-form composed of a series of interconnected individual sheets each having a sheet length B between a leading edge and a trailing edge,said printer comprising: sheet feeding means for conveying the continuous-form initially past an electrophotographic image transfer station and then past an image fixing station; [etc.]

```
? b 351,350

SYSTEM:OS  - DIALOG OneSearch
  File 351::DERWENT WORLD PATENTS INDEX-LATEST
        1981+;DW=9252,UA=9240,UM=9212
  File 350::Derwent World Patents Index
        1963-1980, EQUIVALENTS THRU DW=9247

? exs TC531

Executing  TC531
     S1        4  AN=JP 90303740 + AN=US 535112
                   + AN=US 535112-1990

? t 1/ti/all          (The US NNNNNN-YYYY format is not yet available
                      in WPI, so check titles to eliminate non-relevant
                      records with AN=US 535112 from other series.)

 1/TI/1      (Item 1 from file: 351)
   Continuous-form electrophotographic printer - includes control
for moving continuous sheet forward when stop signal is received
to position sheet leading edge

 1/TI/2      (Item 2 from file: 351)
   Universal concrete screed stake has flat top, pointed bottom,
and longitudinal bend with four pairs of upward pointing fingers
receiving screed edge

 1/TI/3      (Item 1 from file: 350)
   Continuous oxygen vertical refuse converter - producing useful
gases and inert solid residue

        1/TI/4      (Item 2 from file: 350)
          Tapered shaft furnace solid refuse converter - has vapour tig
       refuse and oxygen feed inlets, gas and molten residue outlets
```

? t s1/37/1

1/37/1
008812891 WPI Acc No: 91-316904/43
XRPX Acc No: N91-242742
Continuous-form electrophotographic printer - includes control for moving continuous sheet forward when stop signal is received to position sheet leading edge
Patent Assignee: (OUTP-) OUTPUT TECHN CORP
Author (Inventor): ZAJAC T
Number of Patents: 002
Patent Family:

CC Number	Kind	Date	Week	
US 5019872	A	910528	9143	(Basic)
EP 460303	A	911211	9150	

Priority Data (CC No Date): US 535112 (900608)
Applications (CC,No,Date): EP 90202919 (901102)
Language: English
EP and/or WO Cited Patents: No.SR.Pub
Designated States
(Regional): DE; FR; GB; IT; NL
Abstract (Basic): US 5019872

An image transfer device passes electrophotographic images onto individual sheets as the continuous form is conveyed past the image transfer station. An image fixing device at the image fixing station fixes the transferred images to the individual sheets as the continuous-form is conveyed past the image fixing station. A printer control is operatively connected to the sheet feed, having a sheet register that is responsive to a preset sheet movement distance and to stopping and restarting of movement of the continuous-form.

The continuous-form is indexed relative to the image fixing station to register a leading edge of a sheet with the image fixing station when the continuous-form is stopped. The continuous-form is indexed relative to the image transfer station to register a leading edge of a sheet with the image transfer station when movement of the continuous-form is restarted.

ADVANTAGE - Avoids damage to continuous-form sheets which are not of standard length. @(10pp Dwg.No.1/6)@

Intellectual Property Law in BNA Daily News (DIALOG File 655)

File 655:BNA DAILY NEWS 06/01/90 - 03/15/93
(c) 1992 BNA, Inc.

? e jn=bna patent

Ref	Items	Index-term
E1	509	JN=BNA NATIONAL ENVIRONMENT DAILY
E2	5017	JN=BNA OCCUPATIONAL SAFETY & HEALTH DAILY
E3	0 *	JN=BNA PATENT
E4	4544	JN=BNA PATENT, TRADEMARK & COPYRIGHT LAW DAILY
E5	7403	JN=BNA PENSIONS & BENEFITS DAILY
E6	3851	JN=BNA PRODUCT LIABILITY DAILY
E7	4415	JN=BNA SECURITIES LAW DAILY
E8	361	JN=BNA STATE ENVIRONMENT DAILY
E9	9003	JN=BNA TAX UPDATES
E10	4098	JN=BNA TOXICS LAW DAILY
E11	8418	JN=BNA WASHINGTON INSIDER
E12	16	PD=900524

Enter P or E for more

? s e4

S1 4544 JN="BNA PATENT, TRADEMARK & COPYRIGHT LAW DAILY"

? s s1 and japan?/ti

S2 48 S1 AND JAPAN?/TI

? t /6/1-9

2/6/1
00473974
Loral Fairchild Corp. v. Victor Co. of *Japan* Ltd.
District Court, E.D. New York
No. 92 CV 0128 (SJ) Decided October 13, 1992
LINE COUNT: 46

2/6/2
00472979
Japan
LAW IMPOSING ROYALTIES ON AUDIO, VIDEO EQUIPMENT IS PASSED BY DIET
LINE COUNT: 42

2/6/3
00472978
Japan
PENALTIES FOR LOOK-ALIKE PRODUCTS WOULD INCREASE UNDER MITI PROPOSAL
LINE COUNT: 27

2/6/4
00468487
JAPAN TO DRAFT GUIDELINES ON COMPUTER SOFTWARE COPYRIGHTS
LINE COUNT: 54

2/6/5
00466318
Legislation
BILLS AMEND Section 337 FOR GATT COMPLIANCE, "SPECIAL 301"
TO TARGET *JAPAN* PATENT LAW
LINE COUNT: 131

2/6/6
00452729
Japan
HIGHER *JAPANESE* PENALTIES ON COPYCAT PRODUCT
MANUFACTURERS PROPOSED BY PANEL
LINE COUNT: 41

2/6/7
00444987
Japan
JPO PROPOSES INCREASES IN APPLICATION FEES
LINE COUNT: 80

2/6/8
00440482
Copyrights
JAPANESE AGENCY DRAFTS CHANGES TO IMPOSE ROYALTIES
ON AUDIO-VIDEO EQUIPMENT
LINE COUNT: 56

2/6/9
00436491
REPORT ANALYZES *JAPAN*'S PATENT LAWS IN CONTEXT
GLOBAL HARMONIZATION
LINE COUNT: 81

? t s2/9/9

2/9/9
00436491 DIALOG File 655: BNA DAILY NEWS
BNA PATENT, TRADEMARK & COPYRIGHT LAW DAILY (Copr.)
BNA, Inc.
October 30, 1992

Japan
REPORT ANALYZES *JAPAN*'S PATENT LAWS IN CONTEXT OF GLOBAL HARMONIZATION

LONDON (BNA) -- The Industrial Property Council, an advisory council established by the Ministry of International Trade and Industry (MITI), has issued an English version of a subcommittee report that examines several possible changes to Japanese patent law, WIPR has learned. The purpose of the report, entitled "Subcommittee Report on Patent & Utility Model Lawsand Their Practices Leading to International Harmonization," is to analyze the current state of Japanese patent law in the context of global harmonization and to recommend consideration of certain short- and long-term changes.

According to a source who is familiar with the report, specific issues discussed in it include changing the acceptable scope of amendments to a pending application, eliminating the pre-grant opposition system and eventually introducing a post-grant opposition system, and revising the utility model system.

*

*

*

Patent and Licensing Information in PTS PROMT™

File 16:PTS PROMT - 72-93/March 15
(Copr. 1992 Predicasts)

? s co=chugai pharm?

S1 573 CO=CHUGAI PHARM?

? e en=patent

Ref	Items	Index-term
E1	14921	EN=ORGANIZATIONS & INSTITUTIONS (10)
E2	192959	EN=PARENT-TO-SUBSIDIARY DATA (14)
E3	0 *	EN=PATENT
E4	28614	EN=PATENTS & COPYRIGHTS (37)
E5	4300	EN=PEOPLE (50)
E6	385	EN=PERSONAL HANDICAPS (59)
E7	1868	EN=PERSONAL INCOME (52)
E8	22967	EN=PERSONNEL ADMINISTRATION (28)
E9	313	EN=PHOTO
E10	88482	EN=PLANNING & INFORMATION (22)
E11	9773	EN=PLANT & EQUIP SALES (66)
E12	14036	EN=POLLUTANTS PRODUCED & RECYCLED (42)

Enter P or E for more

? s e4

S2 28614 EN="PATENTS & COPYRIGHTS"

```
? e en=license

Ref   Items   Index-term
E1    39623   EN=LABOR USE (53)
E2    3280    EN=LIABILITIES NEC (89)
E3    0 *     EN=LICENSE
E4    107416  EN=LICENSEE & SALES AGREEMENTS (38)
E5    13828   EN=LINE OF BUSINESS CLASSIFICATION (19)
E6    4636    EN=MANAGEMENT DEVELOPMENT (21)
E7    5522    EN=MANAGEMENT DYNAMICS (20)
E8    38244   EN=MANUFACTURING PROCESSES (32)
E9    582     EN=MAP
E10   150913  EN=MARKET INFORMATION (60)
E11   167698  EN=MARKETING PROCEDURES (24)
E12   24581   EN=NATURAL RESOURCES (41)

          Enter P or E for more


? s e4

      S3  107416  EN="LICENSEE & SALES AGREEMENTS"


? s s1 and s2 and s3

      S4       4  S1 AND S2 AND S3
```

? t /6/all

4/6/1
03914909 DIALOG FILE 16: PTS PROMT
Amgen Inc., Chugai Pharmaceutical Co. Ltd.

*FULL TEXT AVAILABLE IN FORMAT 9 * WORD COUNT: 70

4/6/2
03852679 DIALOG FILE 16: PTS PROMT
News Capsule: Amgen, Chugai Settle

FULL TEXT AVAILABLE IN FORMAT 9 WORD COUNT: 69

4/2/3
03603371 DIALOG FILE 16: PTS PROMT
CHUGAI HAMPERED BY PATENT WOES

FULL TEXT AVAILABLE IN FORMAT 9 WORD COUNT: 181

4/2/4
03162240 DIALOG FILE 16: PTS PROMT
GTN PATENT UPDATE: Genetics Institute Gets European EPO Patent

FULL TEXT AVAILABLE IN FORMAT 9 WORD COUNT: 211

? t s4/9/1

4/9/1
03914909 DIALOG FILE 16: PTS PROMT
Amgen Inc., Chugai Pharmaceutical Co. Ltd.

In Vivo the Business & Medicine Report June, 1992 p. 38
ISSN: 0773-1398

Transaction: As part of a patent settlement, Chugai Pharmaceutical Co. will grant Amgen Inc. an irrevocable, exclusive, royalty-free license to G-CSF patent rights in the US. (May)

Terms/Other: Chugai will also grant Amgen an irrevocable, exclusive, royalty-free license for all G-CSF patent rights in Canada and Mexico. The parties have entered a covenant not to sue each other in several other countries, which applies to all subsidiaries, joint ventures, and licensees.

WORD COUNT: 70

COMPANY:
Amgen
Chugai Pharmaceutical

PRODUCT: Hormones NEC (2834139)
EVENT: Patents & Copyrights (37); Licensee & Sales Agreements (38)
COUNTRY: United States (1USA); Japan (9JPN)

Sources of Patent Information

Mr. Jeremy Sergeant, President, Derwent Inc.

How Can I Access Japanese Patent Information?

If I wanted to start my contribution on a flippant note, I'd answer the question, "**READ THE PATENT, STUPID!**" Which, on the face of it, is the obvious answer -- so long as you can read Japanese, and have the time to scan millions of pages of documents.

Yet, not so long ago, the stupid answer was the only answer. But lots of things have changed. For example

- Global awareness of the value of patents information
- International patenting as a result of the global economy
- English language abstracts and equivalent patents
- Over 40 percent of the worlds' patents are from Japan
- International patent litigation is on the increase
- The Japanese really are innovating, not just copying, and lead in many fields in applying technology: and this is highly patentable

So one can conclude that it is vital to follow technology through patents and that you must to do it internationally. This realization, however, poses some difficulties. You might find

PROBLEM: You cannot read Japancse, yet you want to know what Japanese companies are patenting in your field of technology.

SOLUTION 1: Hope that someone picks up the important Japanese patents and reports them in an English language technical journal that you read.

It is known, however, that over 70 percent of advances reflected in patents are not reported elsewhere. So this solution is not very effective and certainly not at all reliable. What is more it could be too late, because of the time-lag between patenting and publications in journals for example.

SOLUTION 2: Get hold of copies of Japanese patents (in Japanese) that are in the technology area you are interested in, and have them translated.

This is theoretically possible, but let us say that the technology area covers just 2 percent of total Japanese patents. This means that 6,000 patents need to be translated, each averaging, 10 pages. The cost per page is likely to be **$85**, so the total cost will come to about **$18 million** each year. It will not only be costly but slow.

SOLUTION 3: If the Japanese patentee wants coverage outside Japan, for example in an English speaking country, then you will wait until an equivalent patent comes along WHICH IS IN ENGLISH.

Not a bad idea but the waiting may be endless: if it is only patented in Japan you will never see it except in Japanese.

SOLUTION 4: Use one of the international English-language abstracting services.

Such services are indeed widely used and are found to very useful. None are very cheap - but they are an excellent first filter; sometimes being sufficiently informative to avoid the need to look at a translated Japanese patent. Of course there are still occasions when a translation will be necessary - often for legal reasons.

Abstracting Services

Using an English-language patents abstracting service is the most popular way of learning about advances in Japanese technology, and thus about what they are inventing.

I would, therefore, like to spend the remainder of this paper describing these as objectively as possible, but with special emphasis on Derwent's World Patent Index because it is the most used patent information database anywhere -- and also because I work for Derwent.

First a short history lesson. Some time in the 1950s an English chemist called Monty Hyams was working for a company that was in the chemical fire extinguisher business. One of his jobs was to monitor patents brought out by competitors. To do this he would travel up to the London Patent Office once a week to see what new patents had been published in his field of interest. To aid his memory he would write a short description of the patent after reading it carefully. One day as he was doing this he realized that someone was watching him attentively: so he asked why. It just so happened that the other person was waiting to do exactly the same -- to write an abstract of the identical patent. Out of this experience was born a very simple idea: "If one person compiles an abstract of a patent, then this could be used by everyone else who wants to know about this patent." Soon after that Monty Hyams founded the company called Derwent.

To this day that is, in essence, what Derwent does: we write patent abstracts revealing the significance of a patent and sell them to those who have a need for them. Of course, this is oversimplifying a rather complex operation that now employs over 750 full-time people, most of whom are technical and language specialists at the Masters degree level or higher.

A Japanese patent has several pages of rather legalistic text and some drawings. A Derwent abstract features

- A specially written title
- An abstract of 150-250 words
- A list of identical patents taken out at other patent offices
- Various indexing systems to aid precise retrieval by chemists, for example
- Drawings or chemical structures as appropriate

Derwent covers **all** technologies, broadly dividing them into chemical, including biotechnology; mechanical; and electrical/electronic fields.

And Derwent covers the patents of all major patenting authorities or countries. These include Japan, the United States, Europe-EPO, Germany, France, Great Britain, Russia, South Korea, Australia, Canada, Italy, Sweden, and over 20 more.

The most popular way of acquiring the information is through one of the following major international online information retrieval services:

DIALOG

INFOPRO (often known as ORBIT)

QUESTEL

But the information is also available in many other forms including print, CD-ROM, diskette and magnetic tape.

Annual spending by a user ranges widely, say from $400 up to $40,000 or more. Most users would say that the main strengths of Derwent are

- many years of consistent coverage of patents
- all technology
- english language abstracts
- indexing system
- abstracts and titles which reveal the meaning

The intellectual effort to reach this standard does not come cheaply. As a guideline think of access online to a Derwent abstract as costing $2 whether for a Japanese patent or for any other. Of course, Derwent is not the only provider of Japanese patent information (in English) and I'd like to review some of these other sources.

Chemical Abstract Service (CAS)

A clearly descriptive name of a well-respected service, CAS is part of the American Chemical Society. Its coverage of the chemistry reflected in a patent is good. Many patent experts will use both CAS and Derwent when conducting a serious patent search. And of course CAS covers the worldwide literature of chemistry.

INPADOC

A quasi-governmental organization that covers patents from all countries where patents are granted, although only giving very abbreviated textual details, confined to the original title in the original language.

JAPIO

This is an online file in English, compiled in Japan, and comprising translations of the author's (i.e., patent agent's) abstract from the Japanese original patent. Coverage of patent applications is from 1976 to date. Users seem to regard JAPIO as a worthwhile source although searching tends to lack precision.

Of course, there are many other sources which could be given, often of a rather specific in nature, but those mentioned are probably the key players. In summary, therefore, we need not be discouraged at the language barrier nor put off by the sheer volume of Japanese patent information. Organizations such as CAS, JAPIO, INPADOC, and Derwent, have created practical and cost-effective solutions to the problems -- solutions already being exploited by companies large and small all over the United States.

Opening Address, Day Two

A History of Westinghouse in Japan

Dr. Gene Strull, Executive Director for Technology, Retired, Westinghouse Electric

The Westinghouse Electric Corporation has had a formal relationship with the Mitsubishi Electric Corporation (MELCO) since 1923. Originally a part of the Mitsubishi *zaibatsu*, MELCO was founded in 1921. Quoting from a news release of the time

The purposes of this company are to distribute Westinghouse products throughout Japan and to arrange for the proper servicing of the many old as well as the new users of Westinghouse apparatus in Japan. Adequate stocks will be carried, repair and other service facilities provided and engineering and construction assistance will be supplied to users of the Company's products. The staff in Japan will be almost entirely Japanese. It was a simple matter to assemble the staff because there are sources of Japanese engineers who have been engineers who have been employed at our Works in East Pittsburgh and elsewhere.

After the war, a relationship with Mitsubishi Heavy Industries (MHI) began in 1952. There are smaller involvements with other firms of the Mitsubishi industrial group. The initial licensing agreement between Mitsubishi Electric and Westinghouse covered motors and generators and rapidly expanded to include a broad range of electric products. During the 1950s, steam turbines and later nuclear systems were licensed to Mitsubishi Heavy Industries. followed by combustion turbines in 1961. With MELCO, activities expanded to include radars, electronic warfare pods, and weapon delivery computers.

The size and scope of these activities within Japan enabled Westinghouse to obtain access to scientific and technical information not readily available to small- and medium-size organizations. Early in the agreement, and for many years, the flow of information was into Japan. However, this period proved valuable to Westinghouse because of the relationships developed and an understanding of, and appreciation for Japanese business and culture. From the 1920s until 1991 MELCO personnel worked at various Westinghouse facilities in the United States.

In 1981, the Westinghouse/Mitsubishi Engineering Exchange Program was begun. This program, which continued through 1991, placed MELCO engineers with Westinghouse for one year and Westinghouse engineers at MELCO for one year -- after three months of language and culture training. Alumni of this program have proved to be an outstanding resource in improving the effectiveness of Japanese visits to the United States and vice versa.

Also important to “Westinghouse in Japan” has been additional in-country presence. The usefulness of a local office, staffed by both American and Japanese cannot be overemphasized. Initial visits to Japan were virtually always escorted by a person from the Tokyo office, a person from MELCO, or both. This field training provided a window on Japanese technology, planning, and business methods. The Japanese in the Tokyo office provided a capability in obtaining information, both formally and informally. Significant technology news items, the results of conferences, technical literature, etc. was always translated promptly. In addition, the Japanese staff presence at conferences to “catch” the off-the-cuff remarks, answer questions, and gossip at “breaks” or at exhibitions was equally valuable.

For several years, in the late 1980s, Westinghouse and MELCO had a joint R&D Program. The activities encompassed contracted research in either company, visiting scientists and engineers for seminars, forums, etc., and the Exchange Program mentioned earlier. The broad range of topics included motor control, semiconductor materials, materials analysis, and testing.

All of the diverse activities mentioned enabled Westinghouse to acquire and benefit from Japan’s informal and limited distribution of scientific and technical information. I believe that Westinghouse was one of the first, or possibly the first U.S. corporation to appreciate the rapid advance in “Total Quality Management” in Japan over twenty years ago. This awareness, with its implications for trade, markets, and manufacturing has been extremely important to Westinghouse and, in course, the United States.

The term “high technology” is used frequently, almost tritely. The “high” simply stands for high rate of change. The technological world is moving so quickly that no firm of any size can be without an up-to-date knowledge of the information relevant to their business. Through

knowledge comes understanding -- and **everyone benefits**. And now information is international; no one country or laboratory has a monopoly. Japan has become one of the most important science and technology information resources.

Part V. Experiences of Information Users

The Role of the U.S. Embassy in Disseminating Japanese S&T Information

Dr. Richard W. Getzinger, Director, AAAS Directorate
For International Programs

I served in the U.S. Embassy in Tokyo as the Science Counselor for four years, from 1986 to 1990. Throughout that period, monitoring and reporting on Japanese S&T developments was an important part of the work of the embassy's Science Office, which I headed, as well as of the work of several other embassy offices. As you may know, many U.S. government agencies maintain offices either in the embassy or elsewhere in the Tokyo area. A number of these offices share a keen interest in S&T information (STI). These include the Foreign Commercial Service (a part of the Commerce Department), the Office of Naval Research (DOD), the Department of Energy, and the National Science Foundation (NSF). Each of these offices is tasked with its own responsibilities, and does its own reporting to its "home office" in Washington.

Primary responsibility for all S&T matters at the embassy, however, resides in the Science Office, which is a part of the U.S. Department of State. The Science Office has a staff of eight, including three experienced Japanese nationals. In addition to monitoring and reporting on STI, the Science Office is also responsible for handling visitors, keeping the Ambassador and other senior embassy officers informed about the implications of day-to-day S&T developments, and serving as the primary conduit through which the U.S. government communicates with the Japanese government on science and technology matters. It is generally a very busy place!

The assigned duties of the various U.S. government science-related offices in Tokyo sometimes overlap, and there is always the risk of duplicative efforts. This risk has been minimized in recent years by the establishment within the embassy of a Science Council, made up of representatives from each of the S&T offices. The Science Council is chaired by the Deputy Chief of Mission (the number two officer in the embassy) or the Science Counselor, and meets monthly for the purposes of coordinating reporting and sharing of information about important ongoing activities and future visitors.

Embassy officers, regardless of which U.S. agency they represent, are very much aware of the high level of interest in Washington and throughout the U.S. in obtaining as much STI from Japan as possible. Nevertheless they are stretched very thin with other responsibilities, and are definitely limited in the amount of reporting they can do.

An initiative taken in recent years that has significantly enhanced S&T reporting from the embassy has been the use of short-term visitors with technical expertise in areas of special interest. Such visitors, usually one at a time, come to Japan for periods of six weeks to three months, live in housing provided in the embassy housing compound, and, under the guidance of the embassy's Science Office, participate in meetings and site visits throughout Japan that provide the basis for useful S&T reporting. In my experience over a two-three year period this program was highly successful, with experts coming from such diverse organizations as the NSF, NOAA, and the Los Alamos laboratory in New Mexico.

I would like to focus now on the nature and sources of the science and technology information that provides the basis for the bulk of typical, unclassified embassy reporting. The type of STI that is easiest for embassy officers to collect, digest, and write up for transmission is derived from Japanese government activities, and is typically of a general, policy-oriented nature. Examples are annual R&D budgets, attainment of major R&D milestones, decisions to initiate or phase out major research programs, positions to be taken at bilateral or international conferences, and personnel changes in senior government science positions. This type of information is readily available from English-language newspaper reports and government brochures, and from normal Japanese government contacts. It has the additional advantages of being easily understandable to non-technical U.S. government staff both in the embassy and in Washington, and of serving the useful purpose of keeping interested U.S. officials informed about general S&T trends in Japan. On the other hand, it has the disadvantage of being of very limited value to such potential users as U.S. university researchers and U.S. industry.

Under normal circumstances, however, it is very difficult for an embassy science officer to provide more detailed reporting about specific R&D results. The problem is one of a lack of time and, to a lesser extent, of the requisite technical expertise. There is plenty of information avail-

able in English about Japanese technical developments that might be followed up. For example, newspaper stories and company brochures frequently contain descriptions of the latest research "breakthroughs" and new high-tech products about to be brought to the market place. Existing databases (often maintained by the Japanese government) can be culled for useful information. In most cases, site visits can be arranged to provide an opportunity to meet directly with the researchers themselves. In practice, however, it is only when there is a clearly recognized need or a special request from Washington that embassy officers are able to rearrange schedules to expand STI reporting in any particular area.

It goes without saying that embassy efforts to increase the flow of S&T information from Japan to the United States will only fully succeed if the new information is adequately disseminated and utilized in this country. Clearly, the embassy itself can have very little direct impact on this process. Nevertheless, we in the embassy Science Office were much encouraged a few years ago with the establishment by the U.S. government of the STI distribution system known as STRIDE. Under this initiative, special efforts were made in the U.S. to ensure that S&T reporting from Japan reached the widest possible audience in this country. The knowledge that our STI reporting from Tokyo would now reach this much wider U.S. audience served in turn as a stimulus for the embassy staff to devise ways, such as those described above, to provide a broader range of coverage than undertaken previously.

Another means by which enhanced embassy S&T reporting efforts can be encouraged is through feedback from information users in the U.S. Many times it seems to those at the embassy in Tokyo that information sent back to Washington simply disappears into a black hole. It is indeed a rare occurrence when the embassy receives a message either noting the usefulness of a particular report and asking for additional information, or calling attention to a new subject area where some reporting would be especially helpful. Believe me, when such messages arrive they do get attention! In this regard, I might mention that while I was in Tokyo, the occasional appearance of some of our reporting in a foreign technology newsletter, published at that time, I believe, by the Commerce Department, also served to demonstrate that Japanese STI originating in the embassy was reaching a wider audience in the U.S. Despite the limitations on embassy S&T reporting described above, there are other ways that embassy S&T officers can be of assistance to

U.S. university and industry officials interested in Japanese STI. One of the most useful of these is through information exchanges with U.S. S&T-related visitors to Japan. Drawing from my own experience, the kinds of meetings of this sort that were among the most useful were with U.S. aerospace industry representatives. Because of the continuing close coupling of government-to-government, and industry-to-industry relations in this crucial field of high technology, these meetings proved to be especially valuable to me, and, hopefully, also to our U.S. visitors

Japanese Information Gathering & Patent Licensing: The Rockwell International Experience

Dr. Stanley Zehr, Asia-Pacific Technology Liaison Office, Rockwell International Corporation

Why Information about Japanese Technology Is Important to U.S. Companies

Serious competition may exist or be developing in Japan. If your customer base is entirely domestic or if your business area is of interest to the Japanese, your most important competitors may not be U.S. companies. To avoid being blindsided in the marketplace, it is vital to know as much as possible about who these competitors are, what they are doing, and what their future plans are. If your business is worldwide, you also need to know what constitutes a world class operation and how you measure up.

There is a lot of good stuff being developed over there that we can use. R&D projects in Japanese companies and government-related organizations are carefully chosen to be at the forefront of "hot" and rapidly evolving technologies. These technologies are selected because the Japanese believe them fundamental to the future economic success of key industries in Japan, as well as in the United States and Europe. In addition, there is a lot of excellent process and product technology being developed in less critical industries in Japan that may be of immediate practical use and available for licensing.

We can learn a lot. There are basic Japanese attitudes and traditions about business which are quite different from those common in the United States, but that have spawned some particularly effective methods for managing "the product cycle" from initial recognition of a market need and the subsequent R&D planning, through incorporating developing technologies into the manufacturing of useful and profitable commercial products. In a spirit of open-minded pragmatism, some of these practices could profitably be adapted in many U.S. businesses.

We can reduce business risk; R&D is inherently an inefficient process. Initial uncertainties about what will ultimately work and what it will cost are often unavoidable. Furthermore, if the needed technology spans several narrow and deep areas of discipline, it becomes hard for one company, no matter how large, to do it alone. The same can be said for manufacturing, where acquisition of expensive and rapidly evolving capital equipment must be timed precisely to meet a narrow window of opportunity. The up-front capital investments required are often so large and so risky in terms of timing and technology choice, that it is foolish to make the bet alone. In many areas of high technology, the most attractive partners for such risk-reducing collaborations are in Japan.

We can increase income. Often, industrial R&D is technically successful in ways that do not fit well with the core businesses of the sponsoring company. In such cases, it may make sense to seek some return on the R&D investment through out-licensing to companies which can more effectively exploit the orphaned technology. Opportunities to do this in Japan and in other Asian countries such as Taiwan, South Korea, China, and others are enormous. Patent licensing and the resulting revenue can be a welcome source of support for continuing commercial R&D.

More generally, a thorough understanding of the local market in Japan will increase the probability that a product can be uniquely tailored to meet the specific local demands and therefore become successful. You cannot accomplish this without an effective information-gathering and documentation effort.

Sources of Information Available about Japanese Technology

There currently exists a formidable cottage industry devoted to assembling information about Japanese technology and business activity and disseminating it in the form of English-language publications and databases. The sheer volume and diversity of this resource requires considerable selectivity for its effective use. A good start can be made with some of the relatively inexpensive newsletters from United States and Japanese government agencies such as the *NTIS Alert of Foreign Technology* and the *Japanese Technical Literature Bulletin* from the U.S.

Department of Commerce. Japanese government publications include *New Technology Japan* from JETRO, *STA Today* from the Japanese Science and Technology Agency. Consortia such as MCC also provide members with Japanese technical information in their monthly newsletters. Commercially, there is the *COMLINE* monthly report, the *Japan High Tech Report,* and *Techno-Japan,* and many others. There are often Japanese technology articles in more broadbased publications such as the *Asian Wall Street Journal*, *The Nikkei Weekly*, *The Journal of the American Chamber of Commerce in Japan*, *Electronic Business Asia,* and the *Far Eastern Review*.

Sources for more specific and detailed technical information in English include the *Japanese Journal of Applied Physics*, the various IEEE *Transactions,* and the technical journals from most of the large Japanese companies such as the *Fuji Electric Journal, Mitsubishi Electric Giho*, the *Matsushita National Technical Report, Sumitomo Electric Technical Review, Hitachi Hyoron,* and many others.

Available online and floppy disk-based database services include DIALOG and EGIS. For more "science" oriented information, there is the Japanese Information Center of Science and Technology (JICST), which is associated with the Japanese Science and Technology Agency with various Japanese- and English-language products. The National Center for Science Information Systems (NACSIS) of the Ministry of Education offers some 20 databases available through the National Science Foundation and Library of Congress.

The local JETRO (Japan External Trade Organization, and arm of MITI) office can often be very helpful in providing leads and contacts about specific technology and products. International trade shows and conferences in the United States are an additional source of up-to-date information. There are also plenty of private consultants eager to help you with information gathering and problem solving related to Japanese technology. The Japanese technology management programs at institutions such as MIT, Stanford, the University of Michigan, Vanderbilt and many others may be helpful as well.

All of the above can be accessed without leaving the United States and provide a broad base for initially identifying organizations in Japan whose work is of most interest.

If a U.S. company has local sales representatives, offices, or other facilities in Japan, it has taken the first small step toward becoming a knowledgeable "local insider." However, just being there is not enough. Active participation in and contribution to the local business community with patience, integrity, competence and genuine interest is needed to achieve even partial acceptance into the informal network of local individuals who are influential in defining the current state and future direction of a particular technology or business sector. This level of local involvement is crucial for long-term business success in Japan. If done right, it can be a path for early access to critical information which may never become accessible through English-language publications. Several divisions of Rockwell have achieved, on their own, this level of local integration in their specific business areas. Other divisions which have not yet reached this stage, are more dependent on the organization to which I belong.

Japanese Information-Gathering at Rockwell

By the mid 1980s, the need for good information about Japanese technology was considered important enough to Rockwell that a formal activity for gathering it was begun within the corporate R&D organization. A little background information about Rockwell may help put this in perspective.

Rockwell is an $11 billion, multi-industry company with facilities in 30 countries employing nearly 80,000 people worldwide. Over 1,000 are in the Asia-Pacific region, with about 350 in Japan. Rockwell businesses currently have a significant presence in 21 countries including eight in the Asia-Pacific region. Over the last decade, geographical and commercial broadening of the company's business interests has occurred to the point where Japan is now crucially important to us as a source of good ideas for novel technology, management methods, improved product quality and future business strategies.

Rockwell has traditionally placed heavy emphasis on R&D to support all its businesses. About 25 percent of our work force are engineers, scientists and technical support personnel. Our total R&D expenditures in 1992 were $1.5 billion, with about $500 million being company-initiated programs. Advanced technology is a critical ingredient in the broad spectrum of products for each of our core business areas of

aerospace, electronics, automotive and graphic systems. Examples of these products are the Space Shuttle, the B-1B fighter jet, a wide range of telecommunications systems including 70 percent of the world's fax modems, commercial and military avionics, global positioning satellite receivers, other commercial and military electronics systems, industrial control and automation, components for light and heavy vehicles, and large commercial printing presses.

Providing information to support these diverse interests requires the monitoring of an extremely broad range of technologies. Gathering the information, however, is only about half the job. Disseminating it effectively to the right people throughout the company is at least an equal challenge.

Our individual divisions are largely autonomous. There is relatively little central corporate guidance, interference or help beyond a vigorous encouragement to successfully execute divisional business plans so that established goals are met, or better yet, exceeded. The functions of R&D and technical information gathering are partial exceptions to this decentralized operating mode. The in-house product development efforts of each division are supplemented by a corporate "Science Center," which has served as a resource for fundamental scientific and engineering expertise for the whole company since 1962. Over the years, its role has evolved in response to changes in relative emphasis of Rockwell's businesses and sources of R&D funding. In particular, over the last decade, the activities of the Science Center have shifted from being primarily government-sponsored defense-related, contract research, mainly in the areas of materials, electronics and optics and information science to a more recent emphasis on company-sponsored R&D to support non-military businesses.

Accompanying this shift has been increased emphasis on developing international business and collaborative activities with foreign companies. This has expanded the mission of the corporate R&D function to include responsibility for locating and evaluating external technologies, including those from Japan, which are of potential use in every part of our organization. A thorough and continually updated knowledge of what is "hot" in each part of the corporation's engineering and design community is needed to do this effectively. Keeping current on everyone's technical needs also provides opportunities for technical

"matchmaking" between apparently unrelated businesses where one may have a problem while another has a solution, but they do not know of each other's existence.

From the time the Japan technology search activity was formally organized in 1986 until about mid 1991, the process was largely carried out by the Asia-Pacific Technology Liaison Office (APTLO) located in Tokyo. This office was first headed by Dr. Jim Martin. During his tenure, Dr. Martin hired a small but extremely capable and dedicated local staff to gather and disseminate technical information and support Japan-related needs from all parts of the company. Since he return to the United States in July 1991, the Tokyo office has been headed by Dr. Atsushi Toda who is a Japanese national with a thorough and patient understanding of the idiosyncracies of U.S. business.

I joined this operation coincident with Jim's return to the United States to act as a U.S. point of contact to facilitate day-to-day communications between Tokyo and the company's U.S. divisions. As a "technology window," we circulate dozens of technical papers, company journals, press releases, database entries, product brochures, etc., to appropriate people in the company. To keep this current, we make an annual round of division visits supplemented with frequent follow-up communications. We also respond to numerous direct requests for specific technical and business information from people at all levels within the company, and facilitate various meetings and visits between Rockwell personnel and representative of Japanese companies and government organizations. We have set up researcher exchanges with Japanese companies and academia and facilitate the support of university research at Japanese institutions in technical areas of importance to Rockwell businesses. Current examples of this include support at Keio University, Tokyo University of Agriculture & Technology, and Tokyo University.

These activities are designed to complement related activities which individual divisions may be doing on their own, such as joint ventures with Japanese companies, collaborative development of specific products, and participation in Japanese standards committees.

Inevitably, the search for technical information leads to ideas for new business opportunities. When appropriate, we work closely with people who are responsible for new business development and for related activities such as technology licensing.

An Example of Information Gathering to Support Overseas Patent Licensing

International patent licensing has become an increasingly important activity for high-tech businesses for a number of reasons. Foremost among these is the increasing value being derived in recent years from dominant patents on key technologies. A great deal of money can be made or expanded, depending on which side of the negotiating table one is sitting. Second, as mentioned, it often makes practical business sense for companies to swallow their "Not Invented Here" pride and simply license needed technology rather than reinventing it. Third, the Process Patent Amendment Act of 1988 became law February 23, 1989.

The Process Patent Amendment Act of 1988 is part of the U.S. Congress' Omnibus Trade and Competitiveness Act of 1988. One of its key objectives was to strengthen the position of intellectual property rights owners attempting to enforce their rights against unlicensed foreign manufacturers. Until this legislation became effective, it was the rule that a U.S. process patent was infringed only by its unauthorized domestic use. Importation, use or sale of products produced by the process overseas were not considered infringing acts. All this was changed by the new act.

Now, unlicensed importers, distributors, retailers and even consumers can become patent infringers if products they sell for use in the United States are produced or certain parts produced, even partially, by an unlicensed, U.S.-patented process. This is true whether the unlicensed process is practiced in the United States or offshore. In addition to creating large new classes of potential infringers and a great deal of job security for intellectual property lawyers, this law has created important new opportunities for U.S. process patent owners to fend off their competitors or to seek potential process patent licensees worldwide. This act also allows the royalty base to be extended substantially beyond the specific process step covered by the licensed patent. Exactly how far this can be pushed remains to be clarified by the courts.

At a time when the combination of economic recession and defense cutbacks are making funds to support R&D especially scarce, the new licensing opportunities opened by this legislation offer an important new way to obtain a financial return from some R&D projects which have been technically successful, but which may not be critical to a company's core businesses.

Accordingly, Rockwell decided about four years ago to begin exploring these newly accessible licensing opportunities for a basic compound semiconductor processing patent which it owned. Preliminary market research, supported by APTLO, revealed that virtually all the large electronics companies in Japan were either using, or contemplating the use of this process in their own products. To plan a reasonable licensing program, access to Japanese technical and business-related information became vital. This was first used to assemble a list of potential licensees, next it was used to estimate the extent to which products made by MITI provided a basis for making these estimates. Information was also needed to understand whether the products of interest were used internally, or sold to other offshore companies on an OEM basis or directly imported into the United States as individual devices. Helpful initial information about this was obtained from published annual reports and company press releases available in Japan.

During actual license negotiations, issues were sometimes raised about the validity of our patent with respect to related Japanese patents or about whether certain unrelated business activities of our company might possibly be covered by patents owned by some of the Japanese companies. This required information about the specific Japanese patents. Throughout the various discussions, basic advice about traditional Japanese business and technical practices from the local APTLO staff was invaluable to the negotiators in placing the discussions in their proper context. The result to date is 18 licenses with Japanese companies (out of about 35 total worldwide) and several million dollars of much-needed revenue to support R&D within the company.

Summary

I have tried to make the case that obtaining technical information from Japan is valuable if not vital to U.S. companies for a wide variety of reasons. A solid base of this type of information is readily available

right here in the United States, but if a company is fortunate enough to have a permanent presence in Japan, there are other opportunities for much broader and deeper access to such information. Within a broadly diversified high tech company like Rockwell, there have been substantial and tangible payoffs from accessing such information. These are not limited to just becoming aware of new products, processes and technology, but also include finding new business opportunities, often in cooperation with Japanese partners, and in maximizing the return on R&D investments through licensing and other business arrangements.

Part VI. Building Human Networks

The Importance of Human Networks in Gathering Japanese Information: The Role of the Japan Information Access Project

Ms. Mindy L. Kotler, Director, Japan Information Access Project

Underlying all the presentations at the third JICST/NTIS conference on how to acquire Japanese scientific and technical information, from discussions of databases to tips on obtaining unpublished scientific papers, is the intensely personal nature of information in Japan. In Japan, ideas are generated and protected within carefully constructed "personal networks." The paper trails, bibliographies, and sense of public education do not exist in Japan to the extent that they do in the United States. A detailed answer to most questions about Japanese S&T should begin with a search for "who might know or might need to know" the answer.

This situation has compelled Japanese companies to organize special "external affairs" departments called *shogai katsudo.* The sole job of these corporate managers is to oversee their company's relationships with outside organizations, particularly the government, and to maintain a constant flow of information. This activity allows companies to receive early warning of policy and market changes. More important, the information process encourages the companies to become involved in making policy, thus allowing regulations to remain unwritten or ambiguous. This emphasis on people over paper creates a system of remarkable capacity, flexibility, and quickness of response. What is lost from a lack of public transparency, is made up by extensive and intense personal relationships.

The Japanese reliance on "human networks" to transmit knowledge presents the American researcher with three important considerations. The first, the debate over "industrial policy" is misleading. Government-initiated projects whether they realize a scientific breakthrough or not, are tremendously important for bringing researchers, bureaucrats, and industry officials together to establish the groundwork for future collaboration. The Japanese government acts as a facilitator among information groups. Japanese government officials do not so much "pick winners" as they "create winning teams."

Two examples come to mind. The Fifth Generation Computer Project was brushed aside in the U.S. as a failure. I doubt if anyone in Japan thought the same. The personal contacts and ties established among researchers across technology fields with government and industry officials were invaluable. The prospects for future collaboration combined with the efforts expended collecting information worldwide are certain to produce results.

Another example is the Ministry of Health and Welfare's establishment in 1990 of the Japan Association for the Advancement of Medical Equipment (JAAME). This organization is typical of the many Japanese, quasi-governmental trade associations. Under JAAME, private manufacturers and university researchers join with Health Ministry officials in study groups. By pooling resources in JAAME, companies and researchers can monitor developments overseas, absorbing information more cost effectively and rapidly than they could accomplish alone. As a result, JAAME will sponsor "catch-up research" and "mould" an industry-government consensus.

These efforts highlight the next point that information is a privilege in Japan. Each group, each "human network," retains control over its information. To be a member of a particular group is to have the privilege of access to its information. Outsiders are not welcome. It is therefore critically important in Japan to belong to the right groups. In the case of S&T, to keep close watch of developments in research and industry, you must become a member of the professional and trade associations that directly affect your business and research. These memberships are something, I believe, that the U.S. government and industry should be insisting upon from Japan.

This leads into the last point, that all the databases, translated literature, and study missions are simply peripheral to access to the people within these organizations. The discussions, regulatory processes, and personal relationships within these associations are the true window to Japanese S&T information. The Japanese government, especially the hardworking officials from JICST and NACSIS, have expended noble and laudable efforts to disseminate Japanese data. Their important efforts, however, are concentrated on but one facet of Japanese information.

The interpretation of Japanese information poses another problem. Most who come to the task with good will expect the commonly cited "cultural differences" and "linguistic barriers" to present significant difficulty. But language and culture, though genuine problems, are also secondary to the real challenge. The very concept of information is at issue.

The Japanese word for information, *joho*, differs dramatically from the American perception. *Joho* did not exist in the Japanese language until the turn of the century, when it was used in a translation of von Clausewitz's *On War* to refer to "military intelligence." The meaning of this word changed as the information needs of the state changed--from promoting military might to developing and safeguarding industrial strength.

In all of its permutations, however, *joho* never has meant only the mere collection of facts. Information always has been considered to be intelligence -- pieces of a puzzle to be organized for some purpose. The Japanese concept of information in contrast to the American one, is something dynamic rather than static, integrated rather than random, and targeted for application.

In contrast to an American style of selective specialization, Japanese organizations predicate their entire existence on a strategy of "total information." American science, industry, and government must therefore come to terms with Japanese counterparts determined to know everything about all subjects and all markets all the time. The Japanese treat information not as something incidental to good business, but as a precondition to any business whatsoever. As noted by Professor Ikujiro Nonaka of Hitotsubashi University in the *Harvard Business Review* (November-December 1991), Japanese companies take a "holistic approach to knowledge" that is their "one sure source of lasting competitive advantage."

Ultimately, it is the human network that makes the seemingly impossible "total information" strategy a basic reality of business and technical research and development in Japan. Those who would compete with Japanese technological enterprises, therefore, must develop a "total information" and human network strategy of their own. Whenever possible, the researcher must plug into Japanese information

networks at the source to obtain good answers. The analyst, in turn, must learn to understand the patterns and purpose of these same information networks to successfully evaluate the research results.

The Japan Information Access Project is an effort to help the Western researcher begin to understand and join Japan's "human networks." The Project is a nonprofit [501(c)(3)], nonpartisan, educational organization to train public and private sector decisionmakers to access, use, and evaluate Japanese information in business, science, and technology. Members learn how to apply Japanese information as a strategic asset for planning, marketing, and R&D. The Project introduces its members to Japan's information networks and helps them to create their own resources on Japan.

The Project has over 250 members from all industries, major universities, government agencies, congress, and overseas. A core activity is to establish industry-specific, member study groups to exchange research techniques on Japan and to create a Western "human network" on Japan. Study groups have been formed for computers, electronics, & semiconductors and intellectual property. Attached is a list of conference proceedings published by the Project as well as documents and translations the Project distributes.

The Project is planning to create an interactive database of international resources on Japanese S&T information which will have an annually updated hard-copy version in the form of a primer on information gathering on Japan. In time, the Project also hopes to track U.S. legislation regarding Japan and science and technology. And last, the Project will be an advocate for greater information openness and accessibility in both the United States and Japan.

Whether Americans compete or cooperate with Japan, we can no longer remain misinformed and merely satisfied with partial answers. We can no longer afford information arrogance--no one company nor individual can possibly know all about Japan. Indeed, it has been our experience that the U.S. companies with Tokyo offices seem the most complacent and least informed about developments in Japan. The senior American managers are simply not effectively using the resources that they have.

The Japan Information Access Project is an effort to actively involve Americans in the information process, to ensure that we do not rely on any one resource, and to work on closing the "information gap" with Japan. We are hopeful that our efforts will help establish a truly equal "global partnership." I urge you to join us.

PUBLICATIONS

AVAILABLE FROM

THE JAPAN INFORMATION ACCESS PROJECT

1. **JAPANESE INFORMATION: WHERE CAN YOU FIND IT AND WHAT DOES IT MEAN? TRADE AND TECHNOLOGY.** 250-page proceedings of February 1992 conference. Complete papers on accessing Japanese patents, financial statements, databases, and techniques for gathering hi-tech information. Includes 25-page directory of information sources. Members $100; Nonmembers $200.

2. **JAPANESE INFORMATION IN COMPUTERS, ELECTRONICS & SEMICONDUCTORS.** 200-page proceedings of September 1992 Workshop. Complete papers outlining methods for collecting and understanding Japanese patents, technology infrastructure, databases, government, translations, and literature on these fields. Includes a 50-page directory of information sources. Members $100; Nonmembers $200.

3. **HOW TO ACQUIRE JAPANESE SCIENTIFIC AND TECHNICAL INFORMATION.** Proceedings of March 1992 JICST/NTIS conference. Complete papers of Japanese and American government officials, information experts, and industry experts. Includes 20-page directory of information sources. Order directly from the U.S. National Technical Information Service (NTIS), #PB92-220201, call (703) 487-4650. Price: $57.

4. **1992 JAPAN INFORMATION ACCESS PROJECT NEWSLETTERS (January - December 1992).** Full of unique and interesting information sources on Japan. 75 pages. Members $30; Nonmembers $60. Individual issues also available.

PLUS SHIPPING & HANDLING:

DOMESTIC SHIPPING	$10
INTERNATIONAL SHIPPING	$25

Japan Information Access Project
1706 R Street, N.W.
Washington, D.C. 20009
(202) 332-5224
Fax: (202) 332-6841

MEMBERS ONLY

PUBLICATIONS
July 1, 1993

The following reports and translations are available to Japan Project members who are engaged in research on one of these subjects and for their personal research use. Costs cover duplication and postage. Prepayment required. Non-U.S. postage extra.

TRANSLATIONS
The following translations are available for $0.50/page.

1. *R&D Structure and Goals of Sumitomo Electric Industries*, June 1992. 19 pages.

2. *Current Status of Fine Ceramics*, a MITI report, March 1991. 85 pages.

3. *Twelfth High Tech Forum-Tribological Advances in Ceramics*, February 1992. 31 pages.

4. *Fifth Symposium on Ultrahigh Temperature Materials*, Selected papers, March 1992. 45 pages.

5. *"U.S. Patent War Against Japan,"* Selected comments from the Japanese press, August 1992. 24 pages.

6. *Globalization of Japan's Research Activities*, Science and Technology Agency report, February 1992. 173 pages.

7. *Survey Report on Research Activities among Japan's Private Enterprises*, Science and Technology Agency, February 1992. 128 pages.

8. *Ninth Symposium on the R&D Project on Basic Technologies for Future Industries-Fine Ceramics*, Selected papers, November 1991. 71 pages.

9. *RISC Processor Technology Development*, August 1992. 50 pages.

10. *Fourth Functionally Gradient Materials Symposium*, Selected articles, October 1991. 164 pages.

11. *Bio Japan '92 Symposium Proceedings*, Selected papers, August 1992. 90 pages.

12. *Optical Fiber Sensors in Japan*, August 1992. 17 pages.

13. *Space Development Program*, March 1992. 15 pages.

14. *Robot Industry Patent Trends*, May 1992. 11 pages.

15. *1992 Annual Report of the Science and Technology Agency: Its Roles and Activities*, August 1992. 40 pages.

16. Selected papers reviewing developments from the October 1991 *International Industrial Robot Exhibition* held in Tokyo, 32 pages.

17. *Semiconductor Industry* - includes a detailed survey on the stagnation in the semiconductor industry, interviews with Japanese executives on the management, technology applications, and new markets. July 1992. 80 pages.

18. Selected Abstracts of *Japan Research and Development Corporation International Symposium on Supermolecules and Molecular System* held November 25-25, 1992, 62 pages.

19. *New Technologies Pending Commercialization from Japan's Universities and National and Public Research Institutions*, March 1992. 45 pages.

20. *Major Indices of Japanese R&D Activity*, Agency of Industrial Science and Technology, June 1992. 78 pages.

21. Selected Papers on a *Symposium on High-Performance Materials for Severe Environments* held November 28-29, 1991. 170 pages.

22. Abstracts of papers presented to the *Erato Symposia 1992* sponsored by the Japan Research Development Corporation, November 1992. 33 pages.

23. Selected papers from *The 18th International Symposium on Space Technology and Science* held May 17, 1992, sponsored by Mitsubishi Heavy Industries and others. 78 pages.

24. *Kawasaki Heavy Industries' Vision for the Year 2000*, December 1992. 30 pages.

25. *MITI Survey on the Establishment of an International Technology Exchange Base in the Tokai Region*, June 1992. 78 pages.

26. *Interim Report on Japan's International Exchange of Scientific Researchers*, March 1992. 128 pages.

27. *Science and Technology Agency Report on the Promotion of Regional Science and Technology*, August 1992. 151 pages.

28. Selected papers on *Robots for Precision Assembly and Clean Rooms*, May 1992. 56 pages.

29. Selected papers from the *Second Photoforming Systems Symposium of the Tokyo Modeling*

Technology Association, May 1992. 88 pages.

30. Four papers on *High-Power KrF Laser*. February 1992. 64 pages.

31. MITI Report on *Diamond-Based High Performance Materials Industrial Policy*, March 1991. 35 pages.

32. Selected papers from the *International Forum on Fine Ceramics 1992*, March 1992. 70 pages.

33. Selected papers from the *19th New Ceramics Seminar on New Functional Ceramics*, March 1992. 61 pages.

34. Selected papers on *Japanese Developments in Micromachine Technology*, June 1992. 47 pages.

35. *Flash, DRAM Memories to Replace Magnetic Disks*, May 1992. 53 pages.

36. Optoelectronics Industry Technology Association's *Survey VII on the Trends and Perspectives of Optoelectronic Technology R&D*, April 1992. 126 pages.

37. Selected articles on *Character Recognition Technology and OCR Systems*, February 1992. 65 pages.

38. Selected articles on the *Standardization of Optical Technology*, July 1992. 40 pages.

39. *Report on the Results of Japanese Research Developments in Inorganic Advanced Materials*, March 1992. 24 pages.

40. *Human Genome Analysis*, March 1992. 46 pages.

41. *Japanese Developments in Factory Automation Networks*, December 1992. 30 pages.

42. *Biotechnology: Japanese Government Funding* -- Bio-related budgets of Japan's government agencies tops ¥100 trillion, February 1992. 12 pages.

43. *Survey of CAD/CAM/CAE Use in Manufacturing*, July 1992. 28 pages.

44. Selected articles from the *30th National Aerospace Laboratory (NAL) Conference* held in Tokyo, October 20 1992. 53 pages.

45. *1992 Annual Report from the Japanese Industrial Standards (JIS) Committee*, January 1993. 35 pages.

46. *MITI Report on the Global Trends and Problems of Industrial Science and Technology*, June 1992. 78 pages.

47. *Status of Government Biotechnology R&D*, July 1991. 71 pages.

48. *21st MITI Survey of the Foreign Operations of Japanese Corporations*, December 1991. 33 pages.

49. *Optoelectronics in Future Automotive Technology*, September 1991. 77 pages.

50. *Report on Development of New Telecommunications Policies in the 1990s*, July 1991. 47 pages.

51. *Evolution and Applications of Machine Translation Systems*, November 1990, 43 pages.

52. *Aggressive R&D Plan by Nippon Steel*, March 1991. 43 pages.

53. *Strategy for Developing Bio-industries*, October 1990. 24 pages.

54. *Directory of Japanese Online Database Services* (specifically economic and science/technology-related databases), January 1990. 29 pages.

55. *Military R&D Results for 1992* [1992 Defense Agency Technical Research and Development Institute (TRDI) conference], November 1992. 55 pages.

56. *R&D on basic Technologies for Future Industries* [Proceedings from 11th AIST Tsukuba General Symposium in Tsukuba City], February 1992. 154 pages.

57. *Semiconductor Lithography Technologies* [2nd Semiconductor Process Symposium--64M DRAM 0.35 Micron device manufacturing technology], November 1992. 36 pages.

58. *Neural Network Developments*, Summer 1992. 95 pages.

59. *Developments in Rapid Prototyping Systems*, September 1992. 64 pages.

60. *New Trends in Electron Microscopy*, December 1992. 38 pages.

61. *Developments in Lightwave Sensing Technology* [Proceedings of the 10th meeting on lightwave sensing technology], December 1992. 34 pages.

62. *Developments in Japan's Aerospace Activities*, May 1993. 30 pages.

63. *Latest Liquid Crystal Process Technology*, October 1992. 137 pages.

64. *FY91 Environmental Research in Japan* [selections of summarized reports of environmental research conducted in FY91 by the national research institutes of government ministries and agencies], September 1992. 238 pages.

OCCASIONAL PAPERS AND DOCUMENTS

Prices as listed.

1. ***The Japan Source: A Directory of the Clinton Administration's Trade & Technology People and Offices***. May 1993. $20.

2. ***Japan 2000***. The final version of the controversial Rochester Institute of Technology symposium on the future of U.S.-Japan relations. (1991) $35.

3. ***Information Perception: A Strategic Gap***. Paper presented to The Third International Conference on Japanese Information in Science, Technology and Commerce, Nancy, France, May 1991. $2.50.

4. ***Technology Policy Initiatives in the Clinton-Gore Administration***. A 48-page Congressional Research Service report. March 18, 1993. $15.

5. ***Reference Guide to Japanese Organizations and Their English Translations***. March 1992. 31 pages. $20.

6. ***Japan-U.S. Relations: Policy Issues For the Clinton Administration and the 103rd Congress****. A 39-page Congressional Research Report Service report. April 29, 1993. $15.*

JAPAN NEWS BRIEFS

Reviews of the Japanese press on selected S&T issues. $3.00 each unless otherwise noted.

1. ***Assessing the Clinton Administration's S&T Policies Toward Japan*** (February 1993)

2. ***Japan's Search for Ways to Counter the U.S. "Patent Offensive"*** (July 1992)

3. ***Japanese Foreign Aid Targets Environmental Markets*** (January 1993)

4. ***Calls for Continued Defense Technology R&D After the Cold War*** (October 1992)

5. ***"The Silent Service" An Overview of the Popular Renegade Nuclear Submarine Comic*** (April 1993)

6. ***Minimap Automation Protocol*** (July 1992)

7. ***Activities of the Society of Japanese Aerospace Companies*** (December 1992)

8. ***Japan's Expanding International Network for Developing its Space Industry*** (July 1992)

9. ***Japan's Industrial Robot Association*** (December 1992)

10. ***Japan's Regional Technology Alliances*** (January 1993)

11. *Japan's Micromachine Project Enters the R&D Stage for Medical and Industrial Uses* (April 1992)

12. *Japan is Forging Ties with Russia in Nuclear Power Technology* (March 1993)

13. *Japan is Seeking to Turn Virtual Reality into a Key Domestic Industry* (June 1992)

14. *Japanese Industrial Policy Toward Electric Vehicles* (April 1993) ($7.50)

15. *MITI and SJAC (Society of Japanese Aerospace Companies) Initiatives with Russia and China to Aid Aerospace Industry* (June 1993).

16. *Japan Automobile Research Institute (JARI)* (June 1993).

17. *Japan Encourages and Develops Emerging Nuclear Power Market in Pacific Ri*m (July 1993).

PLEASE SEND REQUESTS AND PAYMENT TO:

JAPAN INFORMATION ACCESS PROJECT
1706 R STREET, N.W. — TEL: (202) 332-5224
WASHINGTON, D.C. 20009 — FAX: (202) 332-6841

Quality Mores and Best Practices: Competitive Intelligence in Japan.

Dr. Giuliana A. Lavendel, Manager, Information Resources, Palo Alto Research Center, Xerox Corp.

You will remember that old proverb "In Rome, do as the Romans do." I propose that, when looking at Japanese information -- scientific, technical, business-- we do as the Japanese do. This came to mind at a Xerox benchmarking conference in Marina del Rey; we were meeting at the Ritz Carlton, one of the best hotels in the country, where all employees, down to the last dishwasher, are really empowered. The hotel manager gave a presentation about the quality and benchmarking process, and said something which applies to our competitive intelligence challenge:

"Where mores are sufficient, laws are not necessary."

I believe that we have not applied quality and benchmarking principles to the problem of information exchange between the U.S. and Japan, which continues to be a one-way stream, from the U.S.to Japan. In 1989, at a conference in Berlin (Second International Conference on Japanese Information on Science, Technology, and Commerce), I presented a graphic view of the information flow between the U.S. and Japan in 1967-68 (Fig, 1). Today, according to the experts and to the best of my knowledge, the situation is almost the same. The lion's share of R&D is still performed in the U.S. and this, in turn, spurs the torrent of information from America. To quote a former trading company executive, Juro Nakagawa [Nakagawa 1992]: "The major economic activities in the 21st century focus on R&D, which are mainly centered in the triad of the U.S., Europe, and Japan." A recent report on global R&D from the National Science Foundation (NSF 1993) confirms this scenario and updates it (Fig. 2) :

Following Total Quality Management's well-known guidelines we should ask: who are the U.S. customer of Japanese information? They are found among the Fortune 500, mid-size and small businesses, and also the entrepreneurial firms seeking joint ventures with larger partners in America and abroad, a typical Silicon Valley scenario. Furthermore, the benchmarking paradigm prescribes that we identify "best practices." Since the Japanese are the best users of Japanese information, they also represent best practices in gathering it and using it to advantage. In fact, Japanese executives, whether in the U.S. or in their own country, employ optimal methods for obtaining information on Japanese business and STI. The same executives, when faced with an information request from persons they know and trust, respond with remarkable openness. I was fortunate in obtaining candid responses on the subject of information gathering, Japanese-style, in interviews with numerous business contacts. Some of the most cogent observations came to me via E-mail, from business connections I do not even know personally .

"Direct contact with the company would be essential to perform competitive intelligence," a Japanese source stated. As an example, he added that "to obtain competitive information (about the U.S.) we should get involved in the U.S. in any aspect." In fact, he continued, many Japanese companies in the U.S. have "research labs" and development organizations which are nothing else but listening posts. They establish direct contact with the desired source, to get "hot topics" and feed them back home. To be sure, U.S. companies have the opportunity to use their Japanese branches, research labs, and affiliates as information sources or listening posts. It should be even possible for several companies with matching interests to establish collective "research projects" to function as listening posts in Japan.

The Japanese frequently use product acquisition discussions, requests for quotations and other forms of negotiations to focus on companies with interesting products. Merger-acquisition discussion are also very useful sources of confidential information on technology developments, and so are investment banks which serve as intermediaries in negotiations among firms. It is common for Japanese businessmen to obtain prospectuses on competitors from investment bankers -- librarians can obtain them from Disclosure -yet how many people are aware of this resource?

For a strategic overview covering three to five years, trend patent analysis is among the best tools, and widely practiced in Japan -- but not many U.S. companies bother to perform this trend analysis on Japanese competitors; they are content with researching individual projects and patents. Patent analysis, as conducted by the Japanese, always mentions the number of inventors. Why? Because the number of individuals involved may offer an approximation of the technical resources invested in a certain field of invention. Software is an exception, but key software, which usually relates to specific hardware, is well covered in press organs and other public sources. Patent applications, especially the *kokai* "laid open" after eighteen month from filing, are a primary source of information on competitors' focus.

Japanese executives feel they do not have to go out of their way to obtain competitive intelligence because there is enough of it circulating freely, especially in the U.S. On the other hand, they hold that much of this "free" information is inaccurate. One pessimist estimated a "10% accuracy" factor only. In Japan, accuracy is a priority requirement, perhaps because strategic decisions are made on the basis of competitive intelligence.

Just like their counterparts in the U.S., business and technical people in Japan network heavily. However, because of "lifetime employment" and other cultural factors, Japanese staff is less mobile. Intelligence circulates more slowly and over a limited range, e.g., within a certain industrial segment or geographical area; as a consequence, the information on which intelligence is based is more accurate. Intelligence is often the result of meetings where customers of major companies congregate; general discussions, where people talk freely, are very fruitful. College friends often exchange information, but in a more cautious way than in the U.S., where you can gather significant intelligence just standing in a hotel lobby or dining at a restaurant -- or just reading a magazine, for that matter. Information exchanges among friends and acquaintances are conducted in a "gentlemen's agreement" style, which requires mutual disclosure.

Reporters and consultants usually get information from Japan to the U.S. with a delay of two to three weeks, while the reverse flow from the U.S. to Japan is almost instantaneous. This is because the Japanese are more interested in systematic information gathering, and regard it as part of the strategic process. For instance, approximately seventy

Japanese trading companies have a small offices of no more than three people each, scattered in various cities in the U.S. They operate seven days a week and send a continuous stream of information to Japan all day, and even at nighttime if necessary; it would be very interesting to study how information collected in this fashion is filtered and utilized in Japan. At meetings of the Society of Competitive Intelligence Professionals, members exchange stories about the trading companies' eternal vigilance. It is worthy of note that trade company representatives also scan magazines and journals, and send a stream of relevant English-language clippings to Japan, where they are immediately read and understood; no delay for translation intervenes.

At Xerox, we have a resident in Tokyo, stationed at Fuji Xerox, who scans the technical journals. There are many Americans residing in Japan who try to gather intelligence by sifting through journals and interviewing people, but the difficulty they encounter is that they rarely stay put long enough to cement their contacts and establish a human network. The Japanese cite examples of foreign companies, e.g. European firms, which failed because of staff changes: for instance, the case of a new CEO in Europe who did not give a measure of "authority" to his representatives in Japan. Because of Japanese business mores, our federal government and U.S. companies need to station people in Japan for a long time, instead of rotating them periodically. For instance, our company treasures Mr. Roger McDonald, a product manager who has been in Japan for ten years and is still there. Other companies do it right, like Hewlett-Packard, owner of 30 percent of Yotokawa Electric; H-P has fifty permanent residents in Japan. (Xerox has over one hundred Fuji Xerox residents in the U.S. and only seven American residents in Japan, but we are working on establishing a balance.) Some experts believe that managers should be exchanged, with middle and junior levels reporting to a Japanese executive for absorbing language and culture more effectively.

In sum, tenure and contacts are all important for collecting information in the Japanese world. The recently appointed President of Dataquest Japan Ltd. is Kasahiro Yamane, who spent thirty years with Mitsubishi Electric. The Mitsubishi Group is the largest of the six major industrial groups in Japan, and Dataquest made a smart strategic move. (Can you imagine the contacts the Yamane-san has?) In the U.S. consultants are legion; there are fewer consultants in Japan. Newcomers have no chance, since large established firms like Nomura Research or Mc-

Kinsey are preferred. Japanese management feels comfortable with these large companies, which they consider "very professional," while in the U.S., we rely more on the individual consultant. There is a slight blurring of these patterns now.

The Japanese may not be able to speak it fluently, but most educated people in Japan can read English. At PARC, we have Japanese lesson, off and on, all year long, and we are not alone. At Compaq, one of the most visionary companies in the U.S., there are compulsory Japanese classes at lunchtime, so that many people already speak Japanese; there are also evening classes for the eager beavers, but those are not compulsory. It would help us if journals like Nihon Kezai Shimbun, which is printed in the U.S. daily via satellite, were translated immediately. For instance, when a Fuji Xerox/Xerox Corporation joint venture announced its OEM printer agreement with Compaq, Nihon carried the announcement before the American press. It would help if Nikei Zaikai (a Business Week equivalent) appeared in an English translation; its intelligence is mostly accurate. There is the problem of time lapse, since sending an English document to Japan is standard practice, but not the reverse. *Scientific American* is translated into Japanese immediately, cover to cover. When a PARC scientist wrote a groundbreaking paper on ubiquitous computing, it was a matter of just few weeks before it appeared in the Japanese version of *Scientific American*.

Finally, the Japanese do not go for "front office tours" and "fishing expeditions" in their own country. They set up visits and exchanges well in advance, and appreciate offers to make reciprocal technical presentations. Japanese executives especially like unpublished results, as MIT's Prof. Eagar mentions in his paper on the accessibility of Japanese Science and Technology (EAGER, 1992). He was a liaison scientist at the Office of Naval Research in Tokyo, and had the opportunity to observe that the Japanese are quite willing to cooperate in research while competing in the marketplace. "The Japanese are in this for their own benefit, " he writes. "Why shouldn't we be also?" This means that when pursuing Japanese information we should do as the Japanese do. It works.

In the end, as McKinsey pundit believe (LEWIS 1992), we may learn from each other: while Americans assimilate Japanese information gathering, the Japanese economy may open up, become more service

oriented. A win-win transfer of innovation may occur. Mike Porter's analysis in "The Competitive Advantage of Nations" notes that the U.S. experiences strong demand on its local markets, and fierce domestic competition. Japan does not.
Is this a source of current problems?
If so, will the Japanese way of gathering information change?
I wonder.

FIGURE 1

In the year ending March 31, 1987, Japan obtained $1,35 billion in Technical Information from America. America received one third that amount.

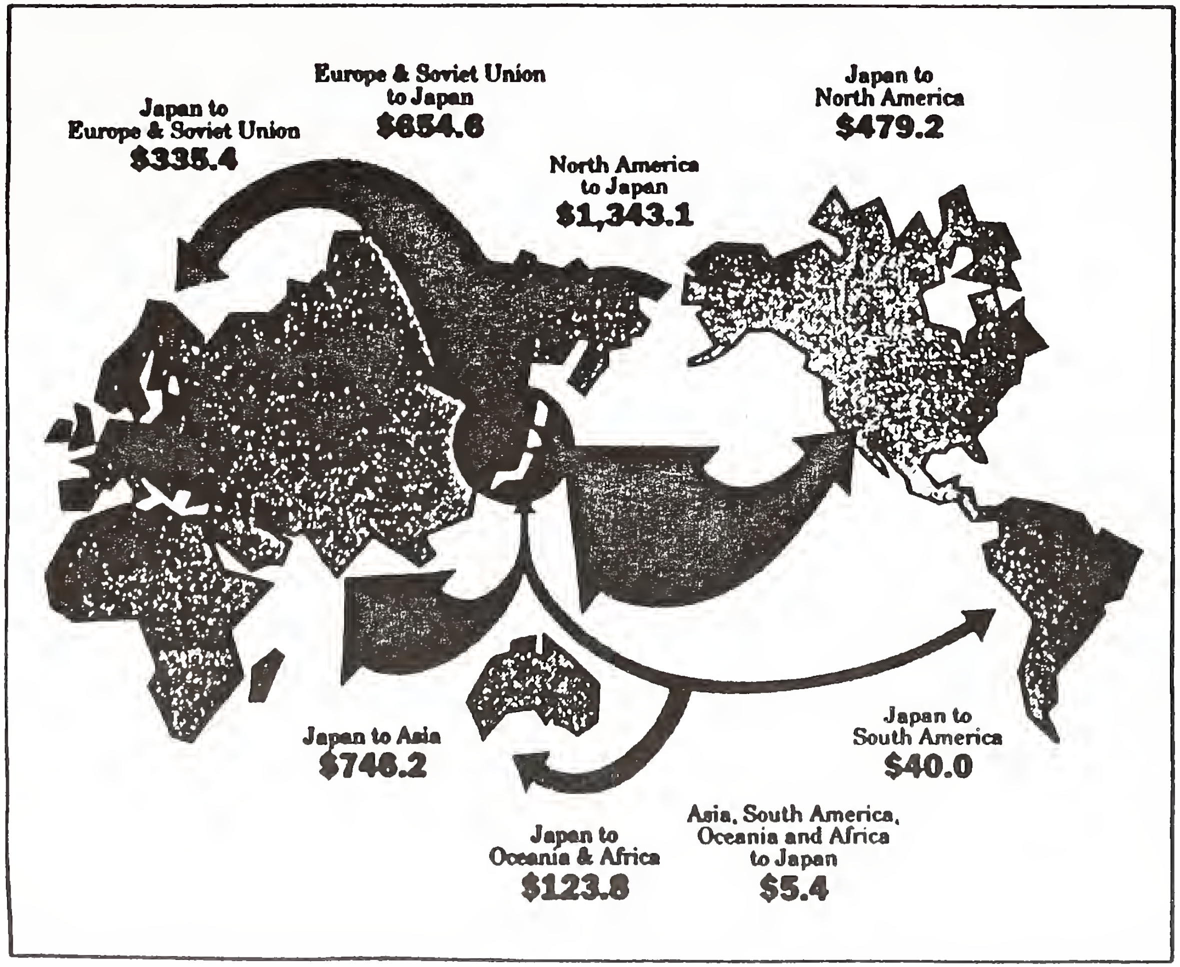
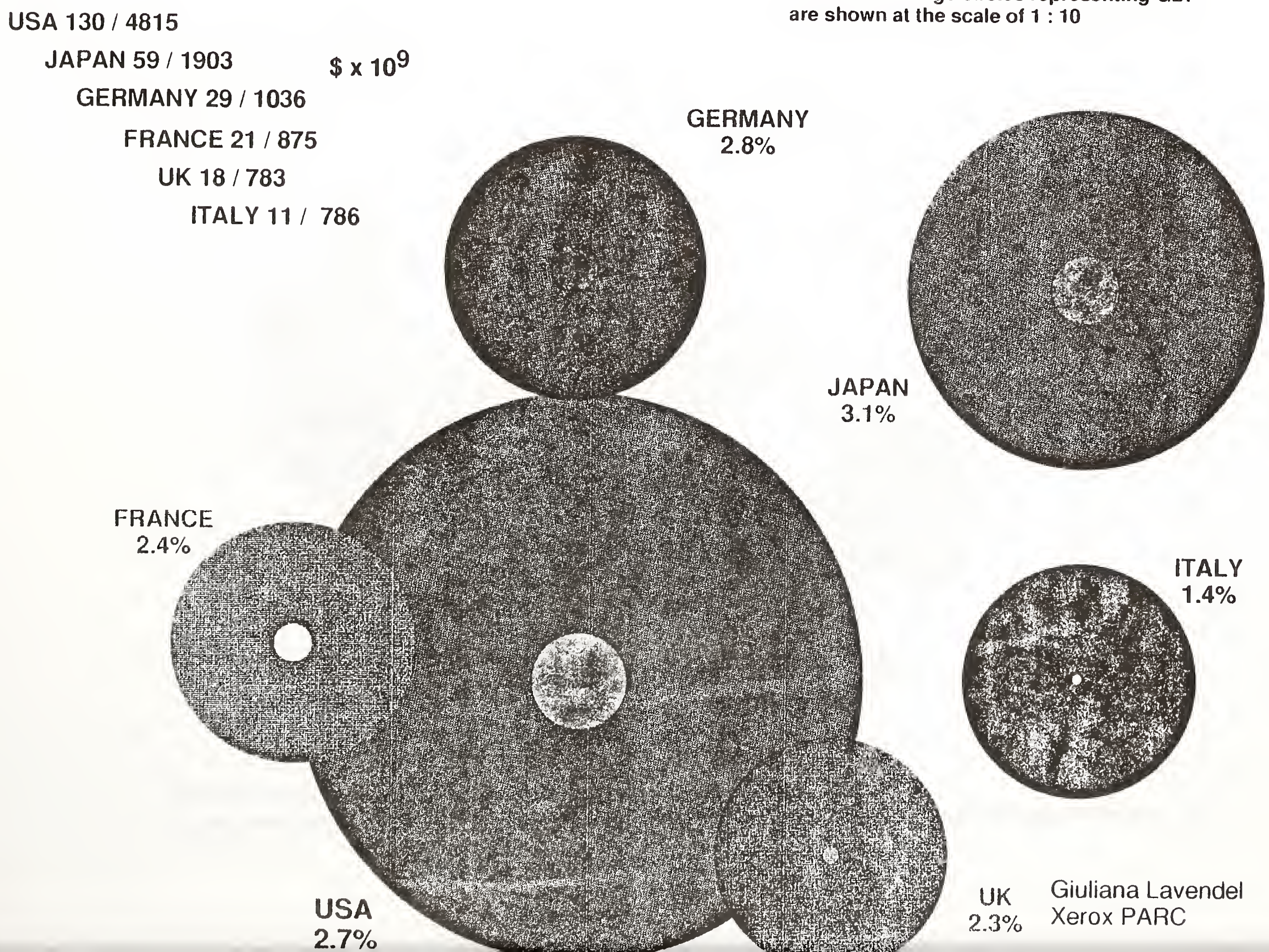


FIGURE 2

RATIO OF R&D EXPENDITURES TO GDP IN 1990 BY COUNTRY



Giuliana Lavendel
Xerox PARC

Bibliography

Eager, T.W. Accessibility of Japanese science and technology. In "Technology Analysis and Its Impact on Competitiveness." SCIP Proceedings, New York, October 1991.

Lavendel, Giuliana. Footbridges across the gap: approaching the Japanese information problem. In Proceedings of the 2nd International Conference on Japanese Information in Science, Technology, and Commerce. Berlin, GMD, 1989.

Lewis, William W. A "win-win" economic policy toward Japan. McKinsey Quarterly 1992 (4).

Nakagawa, Juro. The borderless world. SCIP Annual Conference Proceedings, WAshington, D.C., 1992.

Xerox Palo Alto Research Center

Opportunities for Scientific Research in Japan: The Role of the National Science Foundation

Dr. Alexander P. De Angelis, Program Coordinator,
National Science Foundation, Japan Program

Policy Background

Scientific and technical issues have become a major focus of attention in our relationship with Japan because of their far-reaching implications to our economy and ultimately our well-being as a nation. There are many factors which compel us to pay serious attention to our S&T relationship, including the following:

1. The United States and Japan together account for approximately 40 percent of the world's GNP and therefore share a special responsibility toward the world's energy resources and environment.

2. The United States and Japan are by far the largest investors in R&D in the world, each investing approximately 3 percent of GNP in research and development.

3. The emergence of a global economy based upon knowledge-intensive technologies.

4. The demise of the superpower confrontation has increased the importance of economic competitiveness as a key component of national security.

5. Japan enjoys a $40 billion plus trade surplus with the United States, largely in high technology products.

Many more factors could easily be cited, but these will suffice to demonstrate that the U.S.-Japan S&T relationship is one of global importance. Indeed it is a key element in determining whether we will be able to meet the challenge of competition and cooperation in the coming century.

The importance of the U.S.-Japan S&T relationship has been reaffirmed and indeed has been given increasing emphasis by successive administrations. For example, In June 1988, following protracted and often difficult negotiations, a renewed and expanded U.S.-Japan Agreement on Cooperation in Science and Technology was signed by U.S. President Ronald Reagan and Japanese Prime Minister Yasuhiro Nakasone. It sets forth the following principles to guide the overall relationship:

1. Shared responsibilities and mutual and equitable contributions and benefits commensurate with the two nations respective scientific and technological strengths and resources.

2. Comparable access to major government-sponsored or government-supported programs.

3. Adequate and effective protection of intellectual property.

4. Widest possible dissemination of information.

5. Shared costs of collaboration.

In January 1992 U.S. President George Bush and Prime Minister Kiichi Miyazawa, in what has come to be know as the Tokyo Declaration, reemphasized the importance of the S&T relationship and the growing responsibility of both countries to exert leadership in global matters affected by S&T. The Tokyo Declaration stated

Mindful of their positions as world leaders in scientific research and technical development, the two governments undertake to expand scientific and technical cooperation, including basic research, based on reciprocal access, for the benefit of both societies and the human community.

More recently, the Clinton Administration in its February 22, 1993, statement, *Technology for America's Economic Growth, A New Direction to Build Economic Strength*, specifically singles out Japan for mention as a country which has supported commercial technology as a matter of national policy, a policy to be emulated in certain degree by the United

States. Based on this an other statements from the Administration, there is little doubt that the U.S.-Japan S&T relationship will gain even greater salience with time.

The challenge which we face now and for the foreseeable future is to develop ways to cooperate in science and technology for everyone's benefit with countries such as Japan, the newly emerging technological powers of the Pacific, and the countries of Europe, which are at the same time our greatest economic competitors. It is a difficult challenge in that it does not lend itself to the old world divisions of friends and enemies. Also, in the case of Japan we must struggle hard to stay clear of facile generalities and stereotypes that would blind us to the fact that Japan, for all its vaunted cultural, racial, and linguistic homogeneity, is a large, complex, diverse country of many facets and differences, strengths, and weaknesses.

One generality which tends to get in the way of a clear vision of what is really happening in Japan is the idea that basic research in Japan is weak. Relative to the United States, which has the most highly developed, diversified basic research system in the world, Japan is weak in basic research. But this is a relative perspective comparing systems on an aggregate level. It says nothing about the many areas of research excellence and the many excellent researchers in Japan. Nor does it say anything about the heavy investment which Japan has made in state-of-the-art facilities and equipment, nor about the growing policy emphasis on basic research in Japan.

Numerous delegations of experts have visited Japan over the past five years to assess the state-of-the-art in this or that field. Many have been sent by or through the National Science Foundation under the JTEC (Japanese Technology Evaluation Center) program. These reports, while obviously focused primarily on technological developments, repeatedly point out that in the pursuit of specific technological goals Japanese scientists are achieving noteworthy basic research results. For example, the JTEC *Display Technologies* report points out that world-class basic research in liquid crystal materials is being carried out under Professor S. Kobayashi at the Tokyo University of Agriculture and Technology. Similarly, Professor Shoji Tanaka of Tokyo University is credited as one of the pioneers in basic research on high temperature superconductivity. Such examples of excellence are plentiful.

These two examples also demonstrate the fact that excellent research results are being achieved at Japanese universities, which runs counter to the widely held opinion that university research in Japan is bad. Again, the truth is that there are many examples of excellent research being conducted in Japanese universities as well as in Japanese corporations and government labs, even though the overall system of university research is not comparable to the U.S. Since it is in the nature of fundamental discoveries that one such discovery can change the very foundations of our understanding of the laws of nature, it certainly is in our interests to pursue the possibilities of new insights wherever they may be, including Japan.

The Role of the National Science Foundation

The National Science Foundation is one of many government agencies, each with its own strengths and each serving a particular part of the scientific and technical community, trying to meet the challenge. For NSF the playing field is basic research. The particular challenge is to access the best basic or fundamental research in Japan in order to augment and complement our own capabilities. The NSF Japan Program attempts to do this in many different ways. The goal of the Japan Program is to provide American researchers at all stages of their research careers and from all sectors including universities, government, and corporations, with opportunities to initiate contacts and cooperation with Japan in all sectors including corporations, government, and universities. The Program places special emphasis on researchers at the beginning of their careers so as to provide them with a life-long focus on developments in their field in Japan. (The various components of the NSF Japan Program are briefly described below. Because of the complexity of the programs it is recommended that interested persons enquire of the Japan Program staff about the relevant components: phone (202) 653-5862, fax (202) 653-7775, e-mail "NSFJinfo@nsf.gov" through Internet, or "NSFJinfo@nsf" through BitNet.)

Cooperative Projects

The oldest component of the NSF Japan Program goes back over thirty years to the 1961 Summit Meeting between President Kennedy and Prime Minister Ikeda, from which developed the first S&T bilateral between the United States and any foreign government. This program consists of cooperative research and joint seminars. It has been responsible for introducing thousands of researchers to their U.S. or Japanese counterparts. A cooperative research project begins with a joint proposal for work to be carried out separately at sites in the U.S. and Japan over a two year period during which the counterpart researchers often visit each other for short- to medium-term visits ranging from a week to several months. The purpose of the joint seminars is to develop common research agenda that may lead to joint research projects.

Medium- and Long-Term Visits for Individual Research

Medium-term visits from three to six months duration are supported for Senior Investigators (more than five years beyond the doctoral degree) and Young Investigators (within five years of having received a doctoral degree or equivalent experience).

Long-term visits (referring specifically to this particular element of the NSF Japan Program) of 6 months to two years are supported only for Senior Investigators. (For Young Investigators visits of 6-24 months are also available, but under the program element referred to as Post-doctoral and Junior Faculty Research Fellowships below.)

Post-doctoral and Junior Faculty Research Fellowships

Young Investigators may apply for post-doctoral fellowships in Japan for six to 24 months duration. (As described above, they may also apply for visits of from 3-6 months under a separate program element.) NSF cooperates with three Japanese organizations, the Japan Society for the Promotion of Science (JSPS), the Science and Technology Agency (STA), and the Center for Global Partnership (CGP), to provide fellowships at different types of Japanese laboratories: university, national research institutes or public research corporations, and private industry. For JSPS and STA, NSF receives proposals from U.S. re-

searchers, reviews them for merit, and nominates candidates to the appropriate Japanese agency. JSPS and STA directly fund the fellowships. For the CGP Fellowships, NSF receives and reviews the proposals and makes decisions in consultation with CGP. NSF directly funds the fellowships.

Dissertation Enhancement Awards

The Japan Program will consider dissertation enhancement proposals for stays in Japan from 3-12 months. Japanese host institutions can be in any sector:university, government, or private.

Summer Institute in Japan for U.S. Graduate Students in Science and Engineering, Including Biomedical Science and Engineering

The Summer Institute in Japan provides up to 60 U.S. graduate students first-hand experience in a Japanese research environment, intensive Japanese language training, and an introduction to the science and science-policy infrastructure of Japan. The goals of the Institute are to expose U.S. graduate students to Japanese science and engineering in the context of a research laboratory and to initiate personal relationships which will better enable the students to collaborate with Japanese counterparts in the future. The program lasts for 8 weeks and takes place in two locations: Tokyo and Tsukuba (Relevant Program Announcement: NSF 92-105).

This program is in its fourth year. It began in 1990 with 25 students in Tsukuba Science City and has since grown to its current size of 60 students both in Tsukuba and downtown Tokyo. NSF sponsors 50 of the students in all basic fields and NIH sponsors 10 in biomedical sciences. In 1991 a number of corporations were added as potential host sites. Currently 19 corporations have signed on as potential hosts. Last year nine students were hosted by corporations.

NSF's Arrangement with the Center for Global Partnership

One of the special features of the NSF Japan Program is that it has worked to build partnerships with key institutions in Japan in order to insure access for our scientists to the best resources available. The most recent arrangement has been with the Japan Foundation's Center for Global Partnership which was established only a few years ago. The NSF/CGP arrangement, agreed to in September 1992, allows for young and senior investigators to travel to Japan for research visits ranging from 3-24 months (as described in brief above). NSF receives solicits, receives and reviews the proposals, and selects those to be funded in consultation with CGP. CGP provides the funds to NSF, and NSF makes the grants. Deadlines for application are April 1 and November 1. (This year only there was a special initial deadline of February 15.)

In conclusion, Japan provides many opportunities for valuable scientific cooperation. It is in our best interests as a nation to know what these are and to make them available to America's research scientists and engineers.

Japan's Science and Technology Agency's Fellowship Program in Science and Technology: A Description and History

Mr. Takashi Nitto, Manager, Office of Planning,
Research Development Corporation of Japan

STA Fellowship Program: Introduction

The Science and Technology Agency (STA), an administrative organ of the Government of Japan, established the STA Fellowship Program in 1988. The fellowship offers opportunities for promising young foreign researchers in the fields of science and technology to conduct research at Japan's national laboratories and public research corporations (excluding universities and university-affiliated institutes).

The program is also a response to calls from the international community of science and technology for greater international cooperation through the exchange of promising researchers.

Since Oct. 1, 1989, the program has been managed by the Research Development Corporation of Japan (JRDC), a statutory organization under the supervision of STA, in cooperation with the Japan International Science and Technology Exchange Center (JISTEC). JRDC also has the strong support and cooperation of the Responsible Organizations listed in Table 1.

Fellowship Qualifications

Each applicant for the STA Fellowship should:

- Possess a doctor's degree in a scientific, technological, engineering or medical field, or have an equivalent qualification (if professional, or other, experience indicated a level of competence equivalent to that required of a doctor, the applicant may be considered for a Fellowship);

- Be no greater than 35 years of age, in principle;
- Be of sufficiently good health to pursue research activities in Japan;
- Have sufficient language ability to pursue research activities in Japan. Japanese language ability is preferable, but English is sufficient in most cases. With the agreement of the host research institute, other languages many suffice.

Tenure and Field of Research

The tenure will be from six months to two years, to be decided upon through negotiations between the candidate and the host institute. The results of research activities produced during the tenure will be subject to the regulations of the host institute.

Fellowship Awards

JRDC provides Fellows with the following support:

- A round-trip airline ticket (economy class) between Japan and the Fellow's home country (not available for dependents);
- A monthly living allowance of ¥270,000;
- A family allowance at a flat rate of ¥50,000 per month for Fellows accompanied by one or more dependents during their tenure;
- An initial international settling-in allowance of ¥200,000
- An annual allowance of up to ¥115,000 for travel within Japan related to research activities;
- Housing;
- Normally accommodations are arranged by JISTEC and offered to Fellows free of charge. However, service charges utility bills, etc., must be paid by the Fellows. As a guideline, JISTEC tries to secure apartments with a floor area of $40m^2$ for unaccom-

panied Fellows, and $60m^2$ for Fellows accompanied by dependents (Floor areas will be smaller in metropolitan areas such as Tokyo). If a Fellow prefers a larger apartment for reasons such as family size, up to a maximum of ¥100,000 per month may be paid as a housing allowance toward rent. Any shortfall in rent, usual maintenance costs, and charges for electricity, gas and water, must be borne by the Fellow;

- Medical insurance (not available for dependents).

In addition to the above, ¥516,000 per year will be paid to the host institute to cover research expenses incurred as a result of accepting the Fellow, such as reasonable refitting costs, equipment and materials, consumables, utilities, and various requirements such as books.

Assistance for Fellows

If they wish, Fellows may take advantage of the following assistance:

- Free Japanese-language courses for Fellows whose host research institutes are in the Tsukuba area. Fellows whose institutes are located elsewhere are entitled to reimbursement of reasonable amounts for language tuition at a private school (not available for dependents);

- Since most apartments in Japan are unfurnished, basic furniture and electric appliances will be provided free of charge to Fellows;

- Counseling on problems relating to such aspects of daily life as children's schooling, medical care, and shopping, is available for Fellows living in the Tsukuba area.

Application Procedure: Application through Responsible Organization (Figure 1-A)

Applicants possessing the nationality or citizenship or permanent resident status of a country listed in Table 1 should:

1. Contact the Responsible Organization in their country to obtain an application form and information about the host research institutes given in Table 2.

2. Communicate with host research institutes of interest to ascertain their suitability for the applicant's area of specialization. This should be done on Form 1 in the application packet.

3. After agreeing with the prospective host institute on the subject of research, the length of tenure and starting date for the Fellowship, the applicant should obtain from the institute a formal letter of acceptance expressing its willingness to serve as a host.

4. Submit the completed application form and the letter of acceptance to the Responsible Organization concerned. The Responsible Organization will then screen applicants, and submit its recommendations for Fellowship Candidates to JRDC through JISTEC, accompanied by a complete dossier on the candidates.

5. JRDC will then conduct a further screening and notify successful applicants by sending a Letter of Award through JISTEC. The Responsible Organization and the host research institute concerned will also be informed in this respect.

Application Through Host Research Institute (Figure 1-B)

1. Applicants without the nationality or citizenship or permanent resident status of a country with a Responsible Organization should send enquiries directly to institutes of interest listed in Table 2. This should be done using Form 1.

2. The institute will screen the applicant and, if willing to pursue the application, will request him/her to send pertinent documents and information. These will then be sent along with a letter of recommendation to JRDC through JISTEC (complete dossiers on candidates are all submitted to JRDC through JISTEC once a year, usually in July).

3. JRDC will then conduct a further screening and notify successful applicants by sending a Letter of Award through JISTEC. The host research institute concerned will also be informed in this respect.

FIG. 1 PROCEDURAL FLOW FROM CONTACT TO RECEIPT OF AWARD

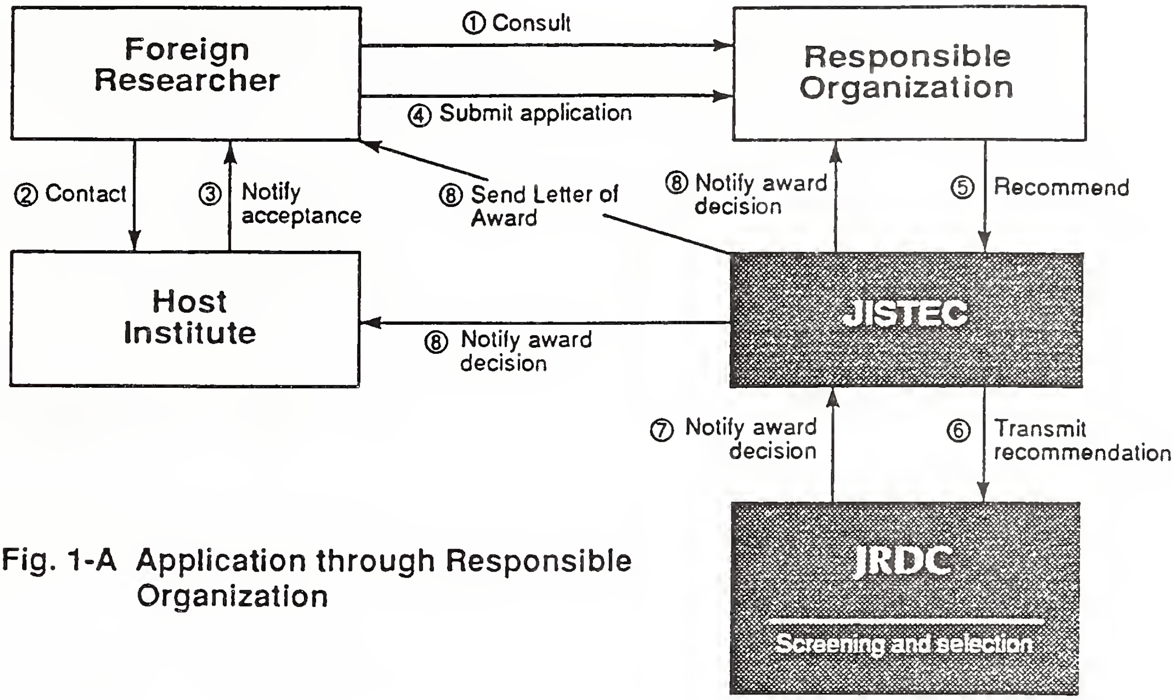


Fig. 1-A Application through Responsible Organization

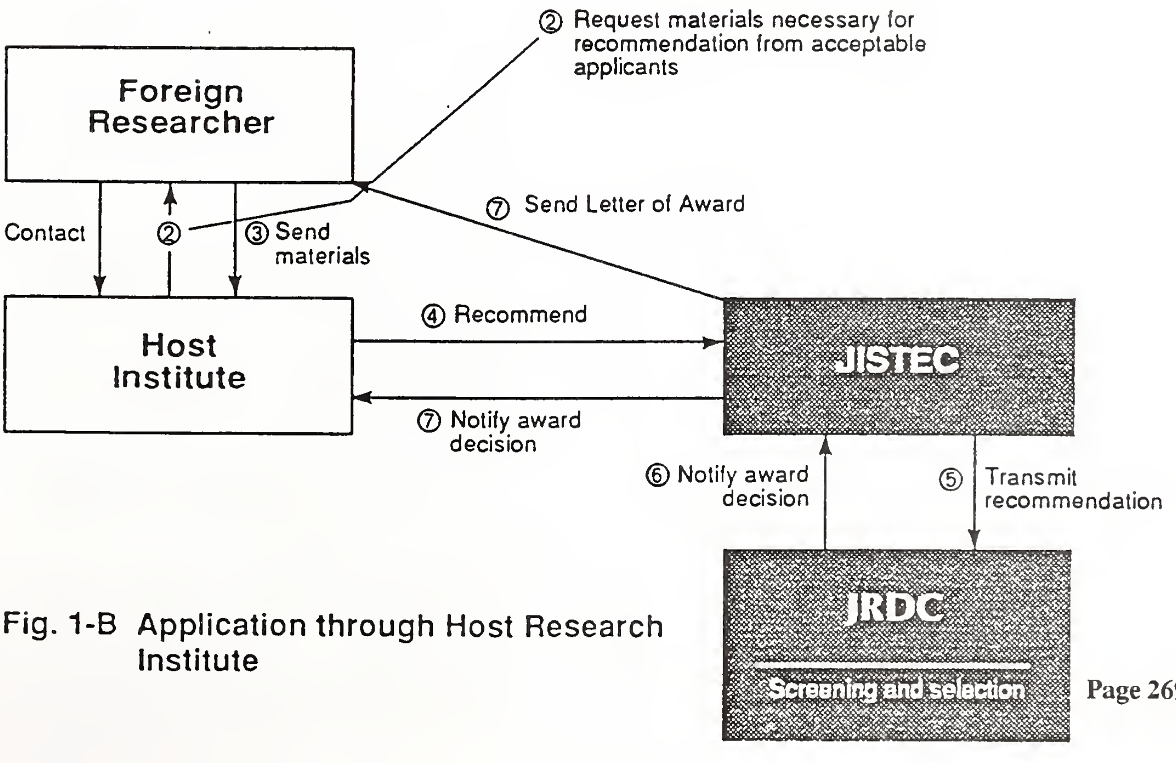


Fig. 1-B Application through Host Research Institute

TABLE 1 RESPONSIBLE ORGANIZATIONS

AUSTRALIA
THE AUSTRALIAN ACADEMY OF SCIENCE
Ms. Bonnie Bauld
International Exchange Officer
GPO BOX 783, Canberra ACT 2601
Tel: 61-6-247-3966 Fax: 61-6-257-4620

AUSTRIA
FEDERAL MINISTRY FOR SCIENCE AND RESEARCH
Ms. Susanna Peterka
Administrative Officer, International Affairs
Minoritenpl atz 5, A 1014 Vienna
Tel: 43-222-531-20-6794 Fax: 43-222-531-20-6486

CANADA
NATURAL SCIENCE AND ENGINEERING RESEARCH COUNCIL
Ms. Eileen P. Garvey
Program Officer, Japan Programs
200 Kent Street, Ottawa, K1A 1H5
Tel: 1-613-947-0190 Fax: 1-613-992-5337

GERMANY
ALEXANDER VON HUMBOLDT-STIFTUNG
Dr. Eberhard Nies
Selection Department
Jean-Paul-Str. 12, D-5300 Bonn 2
Tel: 49-228-833-101 Fax: 49-228-833-199

FINLAND
THE ACADEMY OF FINLAND
Ms. Ritva Helle
International Affairs
P. O. Box 57, SF-00551 Helsinki
Tel: 358-0-7758-316 Fax: 358-0-7758-299

FRANCE
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE
Ms. Françoise Aubujeault
Chief of Asia Division, Mission of International Relations
15 Quai Anatole-France, 75700 Paris
Tel: 33-1-47-53-12-43
Fax: 33-1-47-53-18-70 or 33-1-47-53-00-55

ITALY
MINISTERO DELLA RICERCA SCIENTIFICA E TECHNOLOGICA
Ufficio Relazioni Internazionali
Dr. Maria Enrica Danubio
Head of Bilateral Activities
International Relation Office
Lungotevere Thaon di Revel 76, 00100 Roma
Tel: 39-6-3232642 Fax: 39-6-3221584

NETHERLANDS
STICHTING VOOR DE TECHNISCHE WETENSCHAPPEN (STW)
Dr. C. A. M. Mombers
Program Officer
Postbus 3021, 3502 GA Utrecht
Van Vollenhovenlaan 661, Utrecht
Tel: 31-30-923275 Fax: 31-30-961536

NEW ZEALAND
MINISTRY OF RESEARCH, SCIENCE AND TECHNOLOGY
Ms. Lisa Goodman
International Science Officer
P. O. Box 5336, Wellington
Tel: 64-4-472-6400 Fax: 64-4-471-1284

NORWAY
THE ROYAL NORWEGIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH (NTNF)
Ms. Else Boon
Advisor
P. O. Box 70, Tåsen 0801 Oslo 8
Tel: 47-2-237685 Fax: 47-2-181139 or 47-2-184137

SWEDEN
NUTEK
Ms. Leena Holappa
Administrative Program Officer
Liljeholmsvägen 32, S-117 86, Stockholm
Tel: 46-8-775-4000 Fax: 46-8-19-68-26

SWITZERLAND
SWISS NATIONAL SCIENCE FOUNDATION
Dr. Benno G. Frey
Head of the Fellowship Section
Wildhainweg 20, CH-3012, Bern
Tel: 41-31-27-22-22 Fax: 41-31-23-30-09

UNITED KINGDOM
THE ROYAL SOCIETY
Ms. Vida Cody
Head of Japan Exchanges
6 Carlton House Terrace, London SW1Y 5AG
Tel: 44-71-839-5561 Fax: 44-71-930-2170

UNITED STATES
NATIONAL SCIENCE FOUNDATION
Ms. Janice M. Cassidy
Japan Programs
Division of International Programs
1800 G Street, NW., Washington, D. C. 20550
Tel: 1-202-653-5862 Fax: 1-202-653-5929

EUROPEAN COMMUNITIES
COMMISSION OF THE EUROPEAN COMMUNITIES
Mr. Mario Merla
Directorate-General for Science, Research and Development,
DG XII-G-3, 200 Rue de la Loi, 1049 Brussels, Belgium
Tel: 32-2-295-39-90 Fax: 32-2-296-33-08

TABLE 2 HOST INSTITUTES

National Laboratories

NATIONAL POLICE AGENCY

1 **National Research Institute of Police Science**
6, Sanban-cho, Chiyoda-ku, Tokyo 102
Tel: 03-3261-9986 Fax: 03-3261-9986 ext. 219

HOKKAIDO DEVELOPMENT AGENCY

2 **Civil Engineering Research Institute, Hokkaido Development Bureau**
Hiragishi 1-jo 3-chome, Toyohiraku, Sapporo City, Hokkaido 062
Tel: 011-841-1119 Fax: 011-824-1226 ext. 251

SCIENCE AND TECHNOLOGY AGENCY

3 **National Aerospace Laboratory**
(Research on aerospace technologies)
7-44-1, Jindaijihigashi-machi, Chofu City, Tokyo 182
Tel: 0422-47-5911 Fax: 0422-48-5888 ext. 261

4 **National Research Institute for Metals**
2-3-12, Nakameguro, Meguro-ku, Tokyo 153
Tel: 03-3719-2279 Fax: 03-3792-3337 ext. 290

5 **National Institute of Radiological Sciences**
9-1, Anagawa, 4-chome, Chiba City, Chiba Pref. 260
Tel: 043-251-2111 Tlx: 3722205 NIRS J
Fax: 043-256-9616 ext. 387

6 **National Institute for Research In Inorganic Materials**
1-1, Namiki, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-51-3351 Fax: 0298-52-7449 ext. 227

7 **National Research Institute for Earth Science and Disaster Prevention**
(Earth science and preventative science and technology related to natural disasters)
3-1, Tennodai, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-51-1611 Fax: 0298-51-1622 ext.29

8 **National Institute of Science and Technology Policy**
1-11-39, Nagata-cho, Chiyoda-ku, Tokyo 100
Tel: 03-3581-2391, 2392 Fax: 03-3503-3996

ENVIRONMENT AGENCY

9 **National Institute for Environmental Studies**
(Natural & social sciences; basic & project studies)
16-2, Onogawa, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-51-6111 Fax: 0298-51-4732

10 **National Institute for Minamata Disease**
(Clinical, epidemiological and basic medical research on health effects of methyl mercury)
4058-18 Hama, Minamata City, Kumamoto Pref. 867
Tel: 0966-63-3111 Fax: 0966-63-6844

MINISTRY OF FINANCE

11 **Central Customs Laboratory**
531, Iwase, Matsudo City, Chiba Pref. 271
Tel: 0473-63-4211 Fax: 0473-61-0531

12 **National Research Institute of Brewing**
(Alcoholic beverages; Biotechnology; Fermentation technology)
2-6-30, Takinogawa, Kita-ku, Tokyo 114
Tel: 03-3910-6235 Fax: 03-3910-6239

MINISTRY OF HEALTH AND WELFARE

13 **Institute of Population Problems**
(Research and studies on population problems)
2-2, 1-chome, Kasumigaseki, Chiyoda-ku, Tokyo 100-45
Tel: 03-3591-4816 Fax: 03-3591-4816

14 **National Institute of Health Services Management**
1-21-13, Toyama, Shinjuku-ku, Tokyo 162
Tel: 03-3203-5327 Fax: 03-3202-6853

15 **Institute of Public Health**
(Health policy and management; Promotion and disease prevention; Environmental health)
6-1, Shirokanedai 4-chome, Minato-ku, Tokyo 108
Tel: 03-3441-7111 Tlx: 2428187 INSTPH J
Fax: 03-3446-2615 ext. 210

16 **The National Institute of Health**
10-35, Kamiosaki 2-chome, Shinagawa-ku, Tokyo 141
Tel: 03-3444-2181 Fax: 03-3446-6286

17 **The National Institute of Health and Nutrition**
(Basic & applied research on health promotion; Research on dietary habits of Japanese and food components analysis)
1-23-1, Toyama, Shinjuku-ku, Tokyo 162
Tel: 03-3203-5721 Fax: 03-3202-3278

18 **National Institute of Mental Health, NCNP**
1-7-3, Kohnodai, Ichikawa City, Chiba Pref. 272
(Research and therapy in mental health for the factors of aging, environment, genetics, and bio-chemical reactions)
Tel: 0473-72-0141 Fax: 0473-71-2900

19 **National Institute of Neuroscience, NCNP**
(Basic and clinical research on nervous, mental, muscular and developmental disorders)
4-1-1, Ogawahigashi-cho, Kodaira City, Tokyo 187
Tel: 0423-41-2711 Fax: 0423-44-6745 ext. 2116

20 **National Institute for Leprosy Research**
(Microbiological studies on leprosy bacilli and bioregulatory studies on leprosy)
2-1, 4-chome, Aoba-cho,
Higashimurayama City, Tokyo 189
Tel: 0423-91-8211 Fax: 0423-94-9092 ext. 25

21 **National Cancer Center**
1-1, Tsukiji 5-chome, Chuo-ku, Tokyo 104
Tel: 03-3542-2511 Fax: 03-3545-3567

22 **National Institute of Hygienic Sciences**
(Experimental work on the regulation of food, drugs and other chemicals to protect consumers' health and safety)
1-18-1, Kamiyoga, Setagaya-ku, Tokyo 158
Tel: 03-3700-1141 Tlx: 2466597 JPNIHS J
Fax: 03-3707-6950 ext. 220

23 **National Cardiovascular Center Research Institute**
5-7-1, Fujishiro-dai, Suita City, Osaka 565
Tel: 06-833-5012 Fax: 06-833-9865

24 **National Children's Medical Research Center**
3-35-31, Taishido, Setagaya-ku, Tokyo 154
Tel: 03-3414-8121 Fax: 03-3414-3208

MINISTRY OF AGRICULTURE, FORESTRY AND FISHERIES

25 **National Institute of Animal Industry**
2, Ikenodai, Kukizaki-machi, Inashiki-gun, Ibaraki Pref. 305
Tel: 0298-38-8617 Fax: 0298-38-8606

26 **National Agriculture Research Center**
(Crop science; Agronomy; Crop protection; Farm management)
3-1-1, Kannondai, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-38-8510 Fax: 0298-38-8484

27 **National Institute of Agrobiological Resources**
(Genetic resources; Tissue culture; Recombinant DNA; Biological functions; Radiation breeding)
2-1-2, Kan-non dai, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-38-7406 Fax: 0298-38-7408

28 **National Institute of Agro-Environmental Sciences**
3-1-1, Kannondai, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-38-8161 Fax: 0298-38-8199

29 **National Grassland Research Institute**
(Grassland; Ecology; Plant breeding; Grazing; Soil management; Physiology)
768, Senbonmatsu, Nishinasuno-machi, Nasu-gun, Tochigi Pref. 329-27
Tel. 0287-36-0111 Fax: 0287-36-6629 ext. 203

30 **Fruit Tree Research Station**
(Fruit breeding; Biotechnology; Postharvest; Pomology; Fruit protection/apple, citrus, Japanese pear, peach etc.)
2-1, Fujimoto, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-38-6451 Fax: 0298-38-6437

31 **National Research Institute of Vegetables, Ornamental Plants and Tea**
360, Kusawa, Ano-cho, Age-gun, Mie Pref. 514-23
Tel: 0592-68-1331 Fax: 0592-68-3213

32 **National Research Institute of Agricultural Engineering**
(Irrigation and drainage engineering)
2-1-2, Kannondai, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-38-7506 Fax: 0298-38-7609

33 **Hokkaido National Agricultural Experiment Station**
Hitujigaoka-1, Toyohira-ku, Sapporo City. 062
Tel: 011-851-9141 Fax: 011-853-5916

34 **Tohoku National Agricultural Experiment Station**
4, Akahira, Shimo-kuriyagawa, Morioka City,
Iwate Pref. 020-01
Tel: 0196-41-2145 Fax: 0196-41-7794 ext. 223, 327

35 **Chugoku National Agricultural Experiment Station**
(Studies on the marketing and distribution technology of agricultural products)
6-12-1, Nishifukatsu-cho, Fukuyama City,
Hiroshima Pref. 721
Tel: 0849-23-4100 Fax: 0849-24-7893 ext. 253

36 **Shikoku National Agricultural Experiment Station**
1-3-1, Senyu-cho, Zentsuji City, Kagawa Pref. 765
Tel: 0877-62-0800 Fax: 0877-63-1683

37 **Kyushu National Agricultural Experiment Station**
2421, Suya, Nishigoshi-machi, Kikuchi-gun,
Kumamoto Pref. 861-11
Tel: 096-242-1150 Fax: 096-242-3919

38 **The Hokuriku Agricultural Experiment Station**
(Improving agricultural technology for the heavy snowfall areas)
Inada, 1-2-1, Joetsu City, Niigata Pref. 943-01
Tel: 0255-23-4131 Fax: 0255-24-8578 ext. 203

39 **National Research Institute of Agricultural Economics**
(Overall studies on economic problems related to agriculture)
2-1, Nishigahara 2-chome, Kita-ku, Tokyo 114
Tel: 03-3910-3946 Fax: 03-3940-0232

40 **National Institute of Sericultural and Entomological Science**
(Sericulture; Utilization of insect function)
1-2, Ohwashi, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-38-6004 Fax: 0298-38-6028

41 **National Institute of Animal Health**
(Animal health research)
3-1-1, Kannondai, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-38-7707 Fax: 0298-38-7880

42 **National Food Research Institute**
(Food science; Applied microbiology; Bioconversion)
2-1-2, Kannondai, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-38-8005,7991 Fax: 0298-38-7996

43 **Tropical Agriculture Research Center**
(International collaborative research on agriculture and forestry)
1-2, Ohwashi, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-38-6335 Tlx: 3652456 TARCJP J
Fax: 0298-38-6316

44 **Hokkaido National Fisheries Research Institute**
116, Katsur koi, Kus o City, Hokkaido 085
Tel: 0154-91-9136 Fax: 0154-91-9355

45 **Tohoku National Fisheries Research Institute**
(Methods for managing fishery resources, aquaculture and sea-farming techniques)
27-5, Shinhama-cho 3-chome, Shiogama City,
Miyagi Pref. 985
Tel: 022-365-1191 Fax: 022-367-1250

46 **National Research Institute of Fisheries Science**
5-1, Kachidoki 5-chome, Chuo-ku, Tokyo 104
Tel: 03-3531-1221 Fax: 03-3533-5693 ext. 202

47 **Japan Sea National Fisheries Research Institute**
1-5939-22, Suido-cho, Niigata City, Niigata Pref. 951
Tel: 025-228-0451 Tlx: NSK NG J, No.3122-171
Fax: 025-224-0950

48 **National Research Institute of Far Seas Fisheries**
(Fisheries in the far seas and implementation of maritime research)
7-1, Orido 5-chome, Shimizu City, Shizuoka Pref. 424
Tel: 0543-34-0715 Fax: 0543-35-9642

49 **Nansei National Fisheries Research Institute**
2-17-5, Maruishi, Ohno-cho, Saeki-gun,
Hiroshima Pref. 739-04
Tel: 0829-55-0666 Fax: 0829-54-1216

50 **Seikai National Fisheries Research Institute**
(Population studies; Ecosystemic studies; Cultivation, management techniques)
49, Kokubu-machi, Nagasaki City, Nagasaki Pref. 850
Tel: 0958-22-8158 Fax: 0958-21-4494

51 **National Research Institute of Fisheries Engineering**
(Aquaculture, fishing ports, fishing boats and marine research instruments, fishing gear and methods, research technologies)
Ebidai, Hasaki-machi, Kashima-gun, Ibaraki Pref. 314-04
Tel: 0479-44-4961 Fax: 0479-44-1875

52 **National Research Institute of Aquaculture**
(Basic studies on various aspects of aquaculture)
422-1 Nakatsuhamaura, Nansei-cho, Watarai-gun,
Mie Pref. 516-01
Tel: 05996-6-1830 Fax: 05996-6-1962

53 **Forestry and Forest Products Research Institute**
P. O. Box 16, Tsukuba Norin Kenkyu Danchi-nai,
Ibaraki Pref. 305
Tel: 0298-73-3211 Fax: 0298-74-8507 ext. 221

AGENCY OF INDUSTRIAL SCIENCE AND TECHNOLOGY
MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY

54 **National Institute for Advanced Interdisciplinary Research (NAIR)**
(Atom molecule manipulation; Cluster science; Bionic design)
1-1-4, Higashi, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-54-2500 Fax: 0298-54-2538

55 **National Research Laboratory of Metrology**
(Metrology; Measurement of standards)
1-4, Umezono 1-chome, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-54-4149 Tlx: 3652570 AIST J
Fax: 0298-54-4135

56 **Mechanical Engineering Laboratory**
(Developing advanced technologies for mechanical engineering and contributing to the expansion of industrial science)
Namiki 1-2, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-58-7016 (Research Planning Office)
Tlx: 3652570 AIST J Fax: 0298-58-7033

57 **National Institute of Materials and Chemical Research**
(Science and technology for new materials; Polymer technology; Energy and resources; Standards and safety)
1-1 Higashi, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-54-4444 Tlx: 3652570 AIST J
Fax: 0298-54-4488, 0298-55-1397

58 **Government Industrial Research Institute, Osaka**
(Research and development in the field of technology concerning new materials and new functions of materials)
8-31, Midorigaoka 1-chome, Ikeda City, Osaka 563
Tel: 0727-51-8351 Fax: 0727-51-6945

59 **Government Industrial Research Institute, Nagoya**
(Ceramics [materials, machinery]; Composite material; Solar material; Artificial clay; Biotechnology; Fluorine chemistry; Beam technology)
Hirate-cho 1-chome, Kita-ku, Nagoya City, Aichi Pref. 462
Tel: 052-911-2111 Fax: 052-914-3439 ext. 705

60 **National Institute of Bioscience and Human-Technology**
(Development of biotechnology, bioscience and human-technology for industries)
1, Higashi 1-chome, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-54-6023 Tlx: 3652570 AIST J
Fax: 0298-54-6005

61 **Geological Survey of Japan**
(Basic and applied geology, geochemistry and geophysics)
1-3, Higashi 1-chome, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-54-3576 Tlx: 3652511 GSJ J
Fax: 0298-56-4989

62 **Electrotechnical Laboratory**
(Electronics; Informatics; Energetics; Standards & metrology)
1-1-4, Umezono, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-54-5013 (International Affairs Office)
Tlx: 3652570 AIST J Fax: 0298-58-5345

63 **National Institute for Resources and Environment**
(Development & utilization of mineral resources and energy; Environmental protection; Mine & industrial safety)
16-3, Onogawa, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-58-8111 Tlx: 3652570 AIST J
Fax: 0298-58-8118

64 **Government Industrial Development Laboratory, Hokkaido**
17-2-1, Higashi 2-jo, Tsukisamu, Toyohira-ku, Sapporo City, Hokkaido 062
Tel: 011-857-8404 Fax: 011-857-8901

65 **Government Industrial Research Institute, Kyushu**
(Producing/processing new materials; Use of natural resources; Pollution control)
807-1, Shuku-machi, Tosu City, Saga Pref. 841
Tel: 0942-82-0893 Fax: 0942-83-0850

66 **Government Industrial Research Institute, Shikoku**
(Marine science and technology; Highly functional materials science)
2-3-3, Hananomiya-cho, Takamatsu City, Kagawa Pref. 761
Tel: 0878-67-3511 Fax: 0878-67-8234

67 **Government Industrial Research Institute, Tohoku**
(New materials science; Extraction technology; Geothermal technology)
2-1, Nigatake 4-chome, Miyagino-ku, Sendai City, Miyagi Pref. 983
Tel: 022-237-5211 Fax: 022-236-6839

68 **Government Industrial Research Institute, Chugoku**
(Marine science and technology; Material and system science)
2-2-2, Hiro-Suehiro, Kure City, Hiroshima Pref. 737-01
Tel: 0823-72-1111 Fax: 0823-73-3284 ext. 212

MINISTRY OF TRANSPORT

69 **Ship Research Institute**
38-1, 6-chome, Shinkawa, Mitaka City, Tokyo 181
Tel: 0422-41-3007 Fax: 0422-41-3026

70 **Port and Harbour Research Institute**
(Port; Airport; Coast; Ocean; Soil; Structure; Design; Planning; Dredging; Data base)
1-1, Nagase, 3-chome, Yokosuka City, Kanagawa Pref. 239
Tel: 0468-44-5003 Fax: 0468-42-9265

71 **Electronic Navigation Research Institute**
(Navigation and traffic control system technology)
6-38-1, Shinkawa, Mitaka City, Tokyo 181
Tel: 0422-41-3162 Fax: 0422-41-3169

72 **Traffic Safety and Nuisance Research Institute**
(Research on safety, nuisance control and energy saving for automobiles, railways and aviation)
6-38-1, Shinkawa, Mitaka City, Tokyo 181
Tel: 0422-41-3207 (General Affairs Section)
Fax: 0422-41-3233

73 **Meteorological Research Institute**
(Meteorology; Oceanography; Seismology and related geoscience)
1-1, Nagamine, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-51-7111 Fax: 0298-51-1449 ext. 204

74 **Hydrographic Department, Maritime Safety Agency**
(Oceanographic data and information service; Oceanographic surveys)
3-1, Tsukiji 5-chome, Chuo-ku, Tokyo 104
Tel: 03-3541-3811
Fax: 03-3542-7174 3545-2885 ext 557

75 **Marine Technical College**
(Navigation and engineering training)
12-24, Nishikura-cho, Ashiya, Hyogo Pref. 659
Tel: 0797-22-9341 Fax: 0797-32-7904

76 **Institute for Sea Training**
(General studies on ships' operation techniques)
2-1-3, Kasumigaseki, Chiyoda-ku, Tokyo 100
Tel: 03-3580-3111 ext. 8911 Fax: 03-3580-7972

MINISTRY OF POSTS AND TELECOMMUNICATIONS

77 **Communications Research Laboratory**
(Intelligent communication; Optical/radio application; Informatics; Space technology & science)
4-2-1, Nukui Kita-machi, Koganei City, Tokyo 184
Tel: 0423-21-1211 Tlx: 2832611 DEMPA J
Fax: 0423-27-7458

MINISTRY OF LABOUR

78 **Research Institute of Industrial Safety**
(Safety; Labour accident; Machinery; Ergonomics; Explosion; Construction; Electricity)
1-4-6, Umezono, Kiyose City, Tokyo 204
Tel: 0424-91-4512 Fax: 0424-91-7846

79 **National Institute of Industrial Health**
(Industrial physiology; Toxicology and environmental hygiene)
21-1, Nagao 6-chome, Tama-ku, Kawasaki City, Kanagawa Pref. 214
Tel: 044-865-6111 Fax: 044-865-6116

MINISTRY OF CONSTRUCTION

80 **Public Works Research Institute**
(River; Dam; Sabo; Sewage; Road; Traffic; Bridge; Machinery; Geology; Material; Structure; Earthquake)
1, Asahi, Ooaza, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-64-2211 Tlx: 3652574/PWRIMC J
Fax: 0298-64-1527

81 **Building Research Institute**
(Housing; Planning; Building Sciences)
1 Tatehara, Tsukuba, Ibaraki 305
Tel: 0298-64-2151 Tlx: 72-3652560 BRIMOC J
Fax: 0298-64-2989, 7226

82 **Geographical Survey Institute**
(Surveying and mapping)
Kitasato-1, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-64-1111 Fax: 0298-64-1658 ext. 313

MINISTRY OF HOME AFFAIRS

83 **Fire Research Institute**
(Research on combustion, extinguishment; R&D of firefighting equipment; Studies of hazardous materials, safety)
14-1, Nakahara 3-chome, Mitaka City, Tokyo 181
Tel: 0422-44-8331 Fax: 0422-44-7719

Public Corporations

1 **NHK (Japan Broadcasting Corporation) Science & Technical Research Laboratories**
(Basic and practical studies on broadcast media, applications)
1-10-11, Kinuta, Setagaya-ku, Tokyo 157
Tel: 03-5494-2215 Fax: 03-5494-2440

2 **Japan Atomic Energy Research Institute**
(Research & development of atomic energy)
2-2-2, Uchisaiwaicho, Chiyoda-ku, Tokyo 100
Tel: 03-3592-2368 Tlx: J 24596 Fax: 03-3580-6107

3 **The Institute of Physical and Chemical Research (RIKEN)**
(Comprehensive research on physics, chemistry and biology)
Hirosawa 2-1, Wako City, Saitama Pref. 351-01
Tel: 0484-62-1111 Tlx: 2962818 RIKEN J
Fax: 0484-62-4608 ext. 2431~2434

4 **Research Development Corporation of Japan (JRDC)**
5-2, Nagata-cho 2-chome, Chiyoda-ku, Tokyo 100
Tel: 03-3507-3001 Fax: 03-3581-1486

5 **Power Reactor and Nuclear Fuel Development Corporation (PNC)**
(To establish a well-ballanced nuclear fuel cycle in Japan)
1-9-13, Akasaka, Minato-ku, Tokyo 107
Tel: 03-3586-3311 Tlx: J 26462 Fax: 03-3505-5125 ext. 2402

6 **National Space Development Agency of Japan (NASDA)**
(Implementing agency for space applications and research)
World Trade Center Building, 4-1, Hamamatsu-cho, 2-chome, Minato-ku, Tokyo 105
Tel: 03-5470-4111 Tlx: J28424 Fax: 03-3436-2928

7 **Japan Marine Science and Technology Center**
(Ocean research; Underwater technology; Deepsea survey)
2-15, Natsushima-cho, Yokosuka City, Kanagawa Pref. 237
Tel: 0468-66-3811 Fax: 0468-66-3061

8 **Japan Information Center of Science and Technology**
5-2, Nagatacho 2-chome, Chiyoda-ku, Tokyo 100
Tel: 03-3581-6790 Fax: 03-3593-3980

9 **Japan Sewage Works Agency**
(Sewage works; environment; sanitation)
5141, Shimo-sasame, Toda City, Saitama Pref. 335
Tel: 0484-21-2693 Fax: 0484-21-7542

10 **Institute of Agricultural Machinery (IAM)**
Bio-oriented Technology Research Advancement Institution (BRAIN)
(Development and improvement of agricultural machinery)
1-40-2, Nisshin-cho, Omiya City, Saitama Pref. 331
Tel: 048-663-3901 Fax: 048-651-9655

Non-Profit Organizations

1 **Osaka Bioscience Institute**
(Basic research in molecular biology, enzymes and metabolism, neuroscience, and cell biology)
6-2-4, Furuedai, Suita City, Osaka 565
Tel: 06-872-4812 Fax: 06-872-4818

2 **Remote Sensing Technology Center of Japan**
(Investigation, research and education on remote sensing)
7-15-17, Yuni-Roppongi Building, Roppongi, Minato-ku, Tokyo 106
Tel: 03-3403-1761 Fax: 03-3403-1766

3 **Japan Chemical Analysis Center**
(Analysis of environmental radioactivity)
295-3, Sanno-cho, Inage-ku, Chiba City, Chiba Pref. 281
Tel: 0434-23-5325 Fax: 0434-23-5326

4 **Agricultural Policy Research Committee, Inc.**
1-26-3, Nishigahara, Kita-ku, Tokyo 114
Tel: 03-3910-7223 Fax: 03-3910-7267

5 **International Development Center of Japan**
(Economic development studies; Project evaluation)
Kyofuku Building, 9-11, Tomioka 2-chome, Koto-ku, Tokyo 135
Tel: 03-3630-6911 Fax: 03-3630-8120

6 **Nippon Institute for Biological Science**
(Veterinary pathogens, their infections and preventive measures; Methodology of safety evaluation; Laboratory animals)
2221-1, Sincho, Ome City, Tokyo 198
Tel: 0428-31-5135 Fax: 0428-31-6166

7 **Tottori Mycological Institute**
(Taxonomy; Ecology; Genetics; Breeding; Cultivation; Farm management)
Kokoge-211, Tottori City, Tottori Pref. 689-11
Tel: 0857-51-8111 Fax: 0857-53-1986 ext. 24

8 **Japan Environmental Sanitation Center**
(Environmental engineering; Environmental science)
10-6, Yotsuyakami-machi Kawasaki-ku, Kawasaki City, Kanagawa Pref. 210
Tel: 044-288-4896 Fax: 044-299-2294 ext. 220

9 **The Research Institute of Tuberculosis**
Japan Anti-Tuberculosis Association
(Tuberculosis control program; Surveillance & epidemiology; Clinical & basic studies)
3-1-24, Matsuyama, Kiyose City, Tokyo 204
Tel: 0424-93-5711 Fax: 0424-92-4600

10 **Japanese Foundation for Cancer Research**
(Carcinogenesis; Cancer biology, diagnosis & treatment)
1-37-1, Kami-ikebukuro, Toshima-ku, Tokyo 170
Tel: 03-3918-0111 Fax: 03-3918-0167

11 **International Association of Traffic and Safety Sciences**
(Interdisciplinary research on traffic and related sciences)
2-6-20, Yaesu, Chuo-ku, Tokyo 104
Tel: 03-3273-7884 Fax: 03-3272-7054

12 **Railway Technical Research Institute**
(Comprehensive testing, research and development for railway engineering, railway system and railway business)
2-8-38, Hikari-cho, Kokubunji City, Tokyo 185
Tel: 0425-73-7213 Fax: 0425-73-7255

13 **Overseas Coastal Area Development Institute of Japan**
3-2-4, Kasumiyama Building, Kasumigaseki, Chiyoda-ku, Tokyo 100
Tel: 03-3580-3271 Fax: 03-3580-3657

14 **Japan Weather Association**
(Meteorological analysis; Weather forecast service; Atmospheric and marine survey)
2-9-2,Kandanishiki-cho, Chiyoda-ku, Tokyo 101
Tel: 03-3295-1521 Fax: 03-3292-7835

15 **Hokkaido River Disaster Prevention Research Center**
(Synthetic research of river disaster prevention techniques)
Dai 2 Yuraku Building,1-chome, Nisi, 1-jyo, Minami, Chuo-ku, Sapporo City, Hokkaido 060
Tel: 011-222-8141 Fax: 011-231-3380

16 **Radiation Effects Research Foundation**
(Epidemiological, clinical, pathologic and genetic studies)
5-2 Hijiyama Park, Minami-ku, Hiroshima 732
Tel: 082-261-3131 Fax: 082-263-7279

17 **Kanagawa Academy of Science and Technology**
(R&D for advanced science and technology)
Kanagawa Science Park, 3-2-1, Sakado, Takatsu-ku, Kawasaki City, Kanagawa 213
Tel: 044-819-2030 Fax: 044-819-2026

18 **Superconductivity Research Laboratory (SRL)**
International Superconductivity Technology Center (ISTEC)
10-13Shinonome,1-chome,koto-ku,Tokyo 105
Tel: 03-3536-5703 Fax:03-3536-5714

19 **Institute of Research and Innovation**
(Nuclear chemistry, laser technology, bio-engineering, environmental technology & related investigative research)
1-6-8, Yushima Bunkyo-ku, Tokyo 113
Tel: 03-5689-6351 Fax: 03-5689-6350

20 **Japan Fine Ceramics Center**
(R&D concerning test evaluation, manufacture, applications etc. of fine ceramics)
4-1 Mutsuno 2-chome, Atsuta-ku, Nagoya City, Aichi Pref. 456
Tel: 052-871-3500 Fax: 052-871-3505

21 **Institute for New Generation Computer Technology (ICOT)**
(R&D of fifth generation computer–Parallel and knowledge information processing technology based on logic programming)
Mita Kokusai Bldg., 21F, 1-4-28 Mita, Minato-ku, Tokyo 108
Tel: 03-3456-3191 Fax: 03-3456-3191

22 **Sagami Chemical Research Center**
(Basic research in the fields of organic and biological chemistry)
4-4-1 Nishi-ohnuma, Sagamihara City, Kanagawa Pref. 229
Tel: 0427-42-4791 Fax: 0427-49-7631

23 **Japan Automobile Research Institute, Inc.**
(Research on safety, environmental pollution, energy and new technology applications relating to the automobile)
2530, Karima, Tsukuba City, Ibaraki Pref. 305
Tel: 0298-56-1111 Fax: 0298-56-1122 ext, 317

24 **Japan Wildlife Research Center**
(Wildlife management; Development of research technololgy)
2-29-3, Yushima, Bunkyo-ku, Tokyo 113
Tel: 03-3813-8806 Fax: 03-3813-8958

25 **Akajima Marine Science Laboratory**
Establishment of Tropical Marine Ecological Research (ETMER)
(Basic research on conservation and effective use of tropical sea ecosystems)
179, Aka, Zamami-mura, Shimajiri-gun
Okinawa Pref. 901-33
Tel: 098-987-2304 Fax: 098-987-2875

Reference in Japan

① Research Development Corporation of Japan (JRDC)
Department of International Research Exchanges
5-2, Nagata-cho 2-chome, Chiyoda-ku, Tokyo 100, Japan
Tel: 03-3507-3024~6 Fax: 03-3581-1486

② Japan International Science and Technology Exchange Center (JISTEC)
Port One Building 6F, 1-7-6, Minato-machi, Tsuchiura City, Ibaraki Pref. 300, Japan
Tel: 0298-24-3355 Fax: 0298-24-3214

Access to Japanese Science and Technology: Issues in U.S.-Japan Technology Relations

Dr. Phyllis Genther Yoshida, U.S. Department of Commerce

The emergence of formidable global competitors has forever changed the landscape of international business transactions. The playing field is global. Just as markets are global, so are technology development and technology management, as well as a wide range of business activities.

This business-driven technology diversification means that a firm's internal technology management process must be expanded to include interactions with, and often the involvement of, international R&D players in its overall technology strategy. The United States can no longer operate as an island, and view itself as the world's sole significant inventor.

These changes are particularly evident in U.S.-Japan relations. It goes far beyond the trade imbalance and volatile bilateral trade issues such as the semiconductor and supercomputer agreements, telecommunications procurement, or the automobile voluntary export restraint about which we all hear daily in the news. Japan, as an economic challenger, is bringing to the forefront issues that involve science and technology.

The following charts clearly show some of the trends in the U.S.-Japan science and technology relationship. These charts demonstrate the importance and growing preeminence of Japanese S&T.

The first two charts show how Japanese basic R&D is spreading internationally. U.S. corporate labs in Japan are a fraction of the Japanese ones in the United States.

The next three charts show the results of basic R&D -- patents, licensing, and royalty fees. Again, the balance is uneven.

The last chart indicates what happens to high-tech products that incorporate this knowledge flow. The merchandise trade balance is also skewed.

Where does this leave us? Although the flows of technology are not toward the United States, the product flows are. That is one reason to care about Japanese science and technology.

It also suggests to me that maybe, we need to understand what is happening in Japan. We need to access Japanese science and technology. How do we reverse the flow? This is the role of the Commerce Department.

The Japan Technology Program

The mandate of the Japan Technology Program is to improve the access of, and ability of, U.S. companies and researchers to use important Japanese scientific and technical information. Or, more simply, we try to help Americans find and utilize Japanese knowledge and serve as a facilitator.

The program carries out the mandates of the Japanese Technical Literature Act of 1986 and the U.S.-Japan Science and Technology Agreement for the U.S. Department of Commerce. The program is in the Technology Administration which includes NIST, NTIS, and the Office of the Assistant Secretary for Technology Policy, in which my program is located.

Senators Rockefeller and Baucus in 1986 saw Japan's skill in acquiring and utilizing foreign information to develop commercially applicable technologies. This spurred them to enact the Japanese Technical Literature Act that directs the Secretary of Commerce to increase the availability and understanding of Japanese technical information by coordinating federal government activities and by working with industry.

The United States signed the head-of-government U.S.-Japan Science and Technology Agreement in 1988 to cooperate in research and development in science and technology and to ensure equitable flows of technology. The Japan Technology Program coordinates implementation of the Agreement for the Commerce Department.

The program works on the flow of S&T information and researchers, undertakes negotiations to ensure that Japanese-initiated international R&D programs provide equitable benefits to all participants, and

counsels potential U.S. participants in these programs on how to better utilize them. Examples of negotiations underway include the international Intelligent Manufacturing Systems (IMS) feasibility study and a bilateral program in optoelectronics under Japan's Real World Computing Program.

Finally, we established the new U.S.-Japan Manufacturing Technology Fellowship Program. Unlike existing programs geared for academics and students that send Americans to Japanese universities and national laboratories, our program will send U.S. manufacturing engineers and industrial designers to work in manufacturing in Japanese private companies -- Japan's "centers of excellence."

The Three Components

I just introduced the three components of a successful strategy to access Japanese science and technology which are also the three major components of the Japan Technology Program.

They are understanding that knowledge originates in

- Technical Information -- the explicit transfer of information through documents, studies, databases, translations
- Networking of Individuals -- the tacit transfer of information through personal relationships
- Cooperative Activities -- joint R&D projects

The Japan Technology Program works in all three areas, and as I would argue so should every successful company. Briefly, let me describe our major activities in each of these areas as examples of the type of activities that help us access KNOWLEDGE in these three ways.

Technical Information

The Japan Technology Program serves as the focal point in the U.S. government for activities related to the acquisition, translation, and dissemination of Japanese technical literature. We obtain, abstract, and sell Japanese scientific and technical documents through the Na-

tional Technical Information Service (NTIS), our sister agency within the Technology Administration. I chair the federal interagency Japanese Technical Literature Committee that coordinates government collection activities and tries to find ways to make more information publicly available.

We produce directories of Japanese Technical Resources in the United States and Japanese technical documents entered into the NTIS collection. We commission and publish reports on important Japanese technologies, R&D practices and other issues of relevance to U.S.-Japan science and technology relations.

We publish a quarterly newsletter. We sponsor and cosponsor conferences to disseminate information and to build awareness of Japanese science and technology. Finally, we provide business counseling to companies seeking to monitor developments in Japan.

We believe that creating a system to obtain information and to know what sources of technical information exist is the first step in establishing a successful corporate policy for utilizing Japanese science and technology. It is not cheap and it must be developed in a manner that reinforces the strategic needs of your company. It is the HOMEWORK that prepares your company for the more complicated steps of networking and cooperative activities.

Networking

The second component of knowledge creation and transfer is the networking of individuals to develop long-term personal relationships.

Do you want real time information? You need to know people. And, no where else in the world than in Japan is the key to obtaining knowledge the development and maintenance of such relationships.

The Japan Technology Program works closely with the National Science Foundation and other groups in the United States to encourage Americans to study and work in Japan. These efforts, along with the more favorable exchange rate since 1986, are just starting to pay off in the form of a cadre of Americans who speak Japanese and have lived in Japan for extended periods.

However, two major problems still remain. First, these young Americans worry that going to Japan will jeopardize, rather than enhance, their careers and their employability. Second, there is still a 12 to 1 imbalance in the flow of researchers and students between the United States and Japan. In 1990-1991, it was 45,860 to 3,772.

Japanese companies have long recognized the importance of networking and having their employees experience foreign cultures. Mitsui has stated that "We attach great importance to human resources, which is why every year we send our employees for training overseas." When Americans return home, we must provide positions that will allow them to contribute the knowledge acquired in Japan to the American economy.

The new U.S.-Japan Manufacturing Technology Fellowship Program is under way. It is a joint project of the U.S. Department of Commerce and the Japan External Trade Organization (JETRO) of the Ministry of International Trade and Industry (MITI). The program will enable U.S. manufacturing engineers to work in Japanese private-sector facilities. A program stressing manufacturing and technology management is important because our companies believe that Japan has the most to offer in the area of manufacturing process technology and technology management. Our sales people might have been to Japan, but our engineers have not. In our view, manufacturing matters.

Why is the second component networks? Technology transfer is a "contact sport." Technology is not a stable commodity. These descriptions are apt. Access to, and effective utilization of, knowledge is greatly increased when individuals understand the culture and systems of their foreign partners, and can access information in real time through personal networks. You have to know how the basic facts in written documents and analyses fit together -- and know whether or not you are getting all there is to get.

Cooperative R&D Activities

The third component is cooperative activities. We are increasingly charged with finding a way to help our country cooperate in R&D in order to compete so as to expand and retain global markets, and to increase the world's standard of living. Questions we ask are

- What have we learned from recent experiences negotiating joint R&D projects in precompetitive technology areas with Japan?

- How can we develop knowledge, and thereby benefit from active participation in Japanese government sponsored and supported R&D initiatives?

- How can potential initiatives with Japan, and with the rest of the world, best be structured to provide equitable benefits?

The answers are especially critical challenges in advanced research fields with significant commercial industrial implications. But, even if we successfully answer them, there is one even more important challenge. How can we work within the United States to ensure that the results of such initiatives are adopted and deployed expeditiously into commercially viable products? Let me attempt to answer in terms of a major negotiation we have underway: the multilateral Intelligent Manufacturing Systems (IMS) feasibility study.

Intelligent Manufacturing Systems Talks

Japan proposed international collaborative R&D in intelligent manufacturing systems (IMS), advanced manufacturing. Because of U.S. industry concerns about its structure and equity, it became the subject of international negotiations. We are now in the final stages of negotiations to structure an international program in this field. The negotiations involve participants from Australia, Canada, the European Community, and the European Free Trade Area countries, as well as Japan and the United States. The majority of the negotiators on each delegation are from industry, not government. The Japan Technology Program serves as the U.S. Secretariat.

The objective of the two-year feasibility study-negotiations that began last February is to create and to test a framework for international R&D collaboration. How are we going to work with international partners in areas of shared needs and cooperative strategies for knowledge and technology creation while addressing the more complex issue of technology deployment into the competitive marketplace? How are we going to balance different interests and needs to arrive at an outstanding win-win international program?

The regions agreed at the outset of discussions that four critical issues need to be addressed and resolved: the type of technical projects, equitable methods of cooperation, intellectual property rights and funding, and contribution and funding. We are also undertaking five R&D test cases and one study to provide additional information on the mechanics and difficulties of international collaboration in technology.

What have we learned? We are addressing very real issues, many for the first time on such a scale, in structuring cooperative R&D projects such as IMS. First, we are encountering an issue created by structural asymmetries between the United States and Japan, as well as with the other countries involved in how and where science and technology research is performed, how it is funded, as well as differences in intellectual property rights, methods of information dissemination, and industrial organization. We have all discovered that a better understanding of the differences of each other's systems and that working within these systems is essential to success.

Second, we must look past a perception that our own methods and goals are the best. For example, the EC at the beginning was convinced that their ESPRIT model was the best and Japan was having a hard time recognizing that its domestic collaborative R&D model might not provide the equitable benefits international partners desire. Australia and Canada wanted to be players, but were not sure how. The United States did not want to miss the benefits a good program could bring, but wanted to make sure we could adopt the results as quickly as our partners all the while knowing that we did not have a domestic structure in place like the EC or Japan to do so.

We have moved forward primarily because the industry delegates want to find a way to make it work, and they want to be able to use any results to help them compete. Third, there are other lessons we have already learned including the importance of an industry-academic-government partnership in drafting and implementing strategy, and the real problems in taking domestic schemes for intellectual property rights international. We will learn many more lessons from industry's attempts to develop and implement the test cases, and from our further deliberations to develop a "blueprint" for a program.

We know that R&D collaboration has to be carefully structured to achieve a win-win position that allows the benefits of technology exchange to flow freely to both countries and to ensure that both sides really benefit. Ultimately, successful R&D collaboration also depends on the level of knowledge of the individuals participating, and everyone's acceptance of an overriding framework, in our case, equitable benefits and contributions for cooperative activities.

A successful effort must operate in an environment that includes

1) The opportunity to access and develop scientific and technical knowledge in whatever form it takes. Opportunity must include the perception that a "productive" opportunity exists.

2) Receptivity on the part of the "receiver" to seek out and utilize S&T information, to participate when necessary in activities in which information is exchanged and generated; and to establish human networks that facilitate long-term personal interactions.

3) Mutual and equitable benefits.

Conclusion

I have given you a fast review of why access to Japanese science and technology is an issue, what the U.S. Department of Commerce does in this area, and the three components of any successful strategy to access Japanese science and technology: Technical Information, Networking and Cooperative R&D.

There is much knowledge to be gained and shared with Japan in each of these areas but IT IS NOT EASY. If you think it is easy and that you are getting everything, you can be sure that you are not. The questions are: First, are you getting enough?

- Much Information -- Much Of It LOW QUALITY (The higher the quality of the information or the more strategic, the more difficult it is to access. There are few shortcuts to knowledge -- there are to isolated facts.)

- HUMAN NETWORKS are time consuming and difficult to develop and keep up. Without them, forget real time access.

- COOPERATION -- you need to but are you benefiting as much as your partner? Do you know the REAL benefits to your company or to your partner? (A clue -- in Japan, the benefits aren't just $$$)

Second, are you using what you get? Success ultimately means the adoption and deployment of a technology into an existing or new product -- and winning market share.

Knowledge allows companies to make investments that result in profits. It allows governments and universities to make investments that promote the development of new science and technology. And properly utilized, knowledge results in a more competitive economy and a better standard of living.

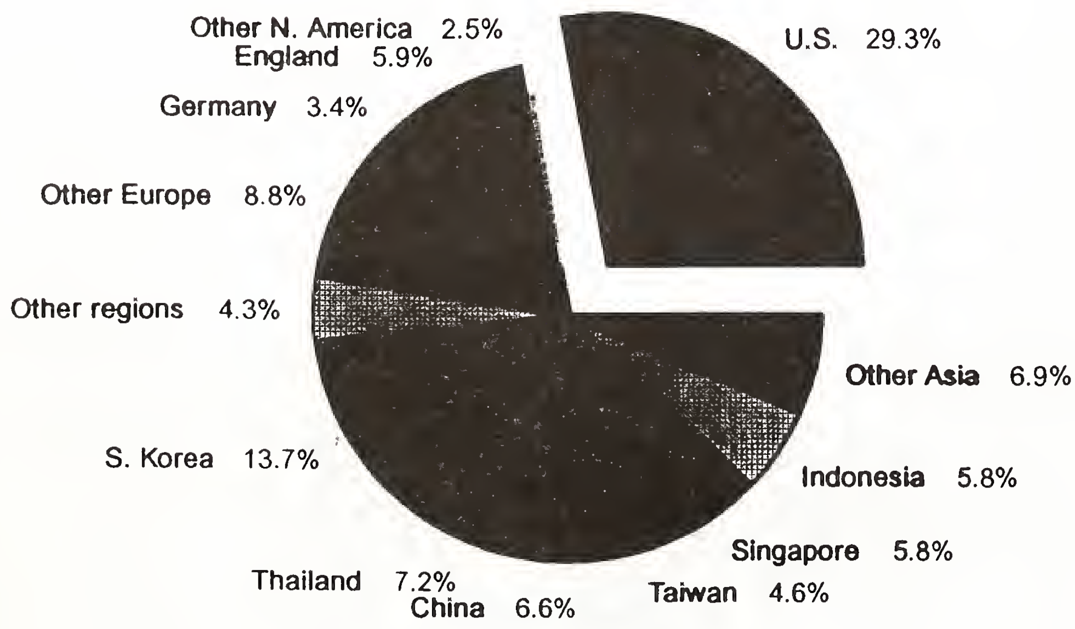
If the United States is to remain a competitive economic power, we cannot ignore that Japan is increasingly an important source of scientific and technical knowledge. Part of Japan's economic success can be attributed to its active national and private sector efforts to collect and apply foreign scientific and technical knowledge.

In closing, you have to invent it and understand how it works, before you can manufacture it. And you have to manufacture it, before you can sell it. All of which must now be undertaken in a global playing field with the emergence of formidable global competitors that have forever changed the landscape of science and technology.

1990 Japanese Technology Exports

by Country, Percentage of 339.4 Billion Yen Total

Note: the Japanese source does not specify the nature of the "technology" commodity, but it is assumed to be intellectual property rights (royalties and licensing fees), not products.



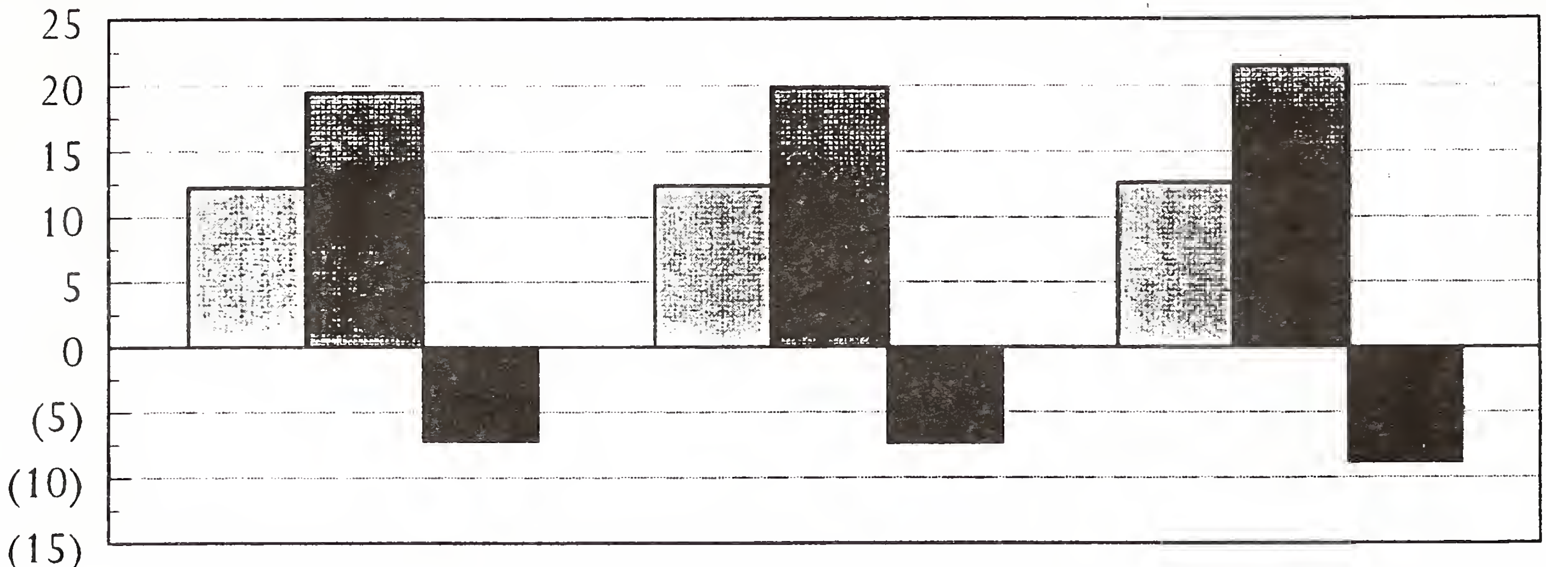
Source: Government of Japan, Statistics Department

Prepared by the Office of the Assistant Secretary for Technology Policy

May 1993

with Japan

Billions of Dollars

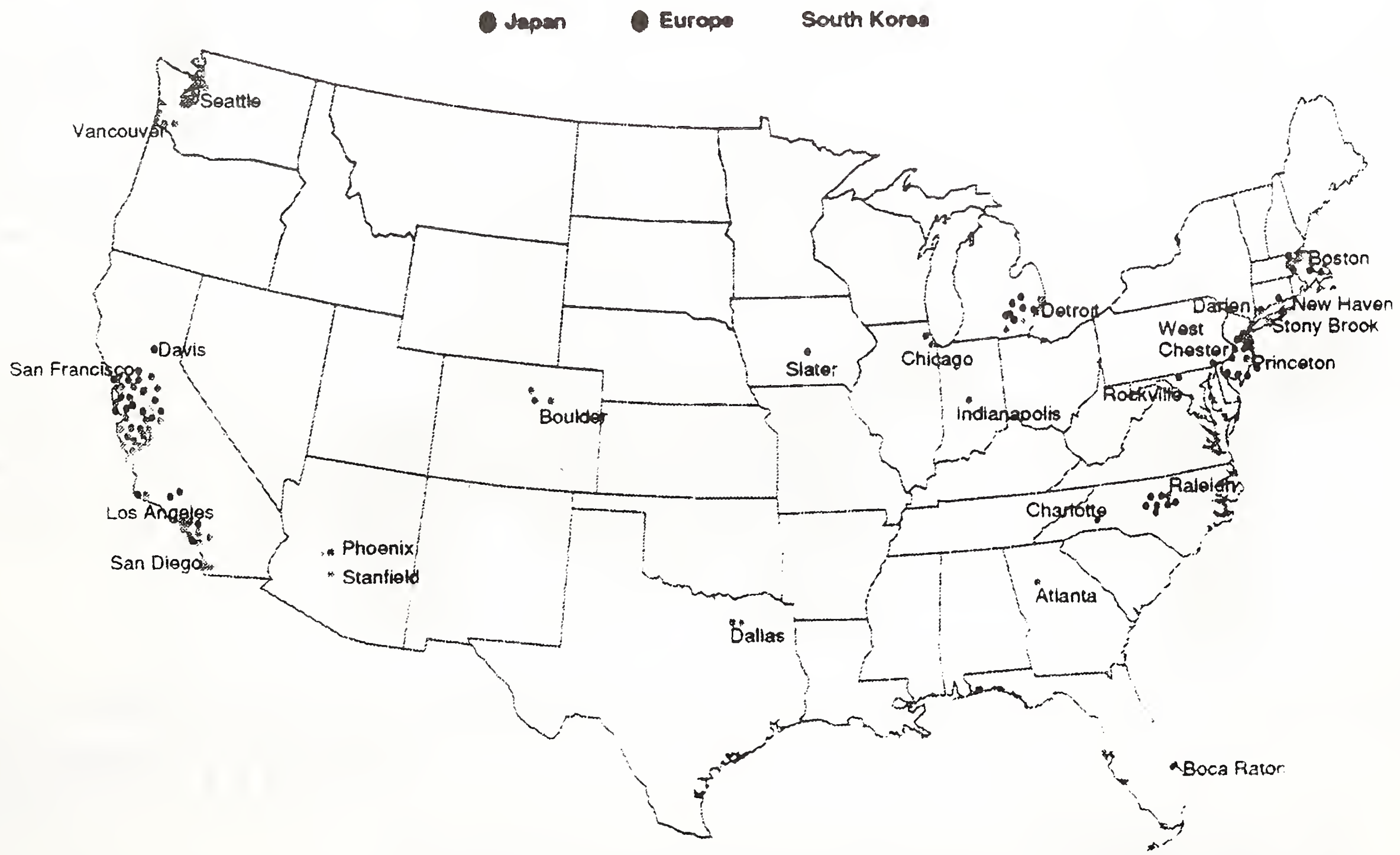


	1990	1991	1992
Exports	12.2170	12.3653	12.6058
Imports	19.4502	19.7994	21.4762
Balance	(7.2332)	(7.4341)	(8.8704)

Source: U.S. Bureau of the Census
Foreign Trade Division
Paul Harrick, 301-763-5200

Figures include software totals. 1992 values subject to future revisions.

Foreign Research Centers in the United States



U.S. R&D Facilities of Foreign Companies
Selected Industries and Companies, 1992

Industry	Japan	Germany	Korea	Netherlands	United Kingdom	Swiss	Sweden	France	Others
Computers	20	3	4	1					
Software	21	2	1	1					
Semiconductors	18	2	3	1					
Telecomm.	14	3	1				1		3
Opto-electronics	8	3							
HDTV	7	1		1				1	
Semiconductor Manuf. Equip.	5								
Medical Equip.	1	2							
Biotechnology	17	12		4	13	11	2	11	4
Automotive	30	7	3				1		

U.S. Patents Granted, by Company, 1991

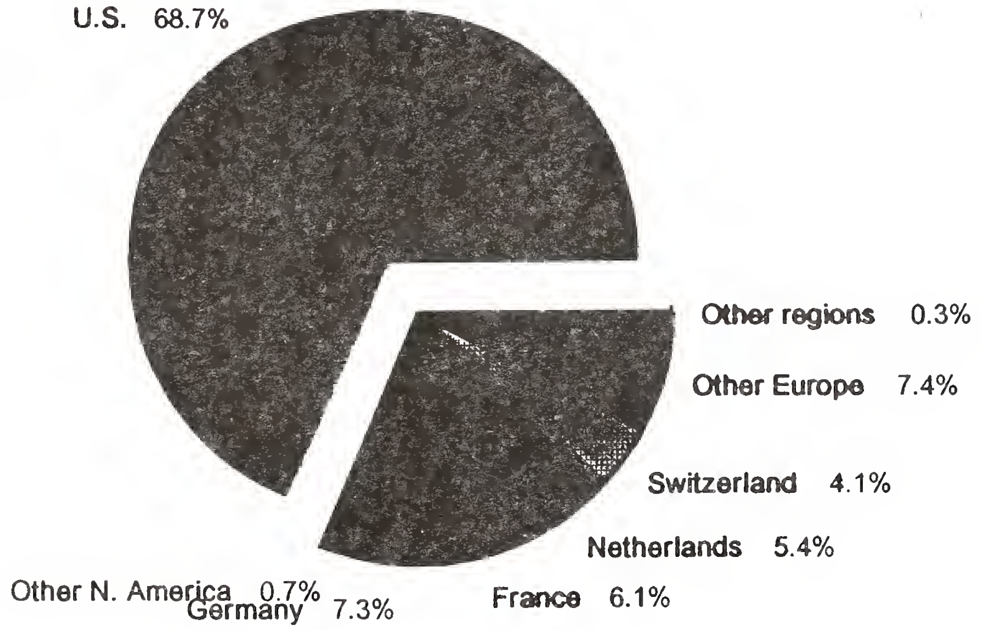
	Company	Country	Number of U.S. Patents
1.	Toshiba	Japan	1,156
2.	Hitachi	Japan	1,139
3.	Mitsubishi	Japan	959
4.	General Electric	U.S.	923
5.	E. Kodak	U.S.	887
6.	General Motors	U.S.	863
7.	Canon	Japan	828
8.	Philips	Netherlands	768
9.	Fuji Photo Film	Japan	742
10.	Bayer	Germany	706
11.	IBM	U.S.	680
12.	Motorola	U.S.	631
13.	DuPont	U.S.	631
14.	Siemens	Germany	610
15.	Hoechst	Germany	575
16.	Matsushita	Japan	561
17.	AT&T	U.S.	487
18.	NEC	Japan	482
19.	BASF	Germany	464
20.	Dow Chemical	U.S.	439
21.	Ciba-Geigy	Switzerland	430
22.	Sharp	Japan	388
23.	Nissan	Japan	385
24.	Fujitsu	Japan	382
25.	Texas Instruments	U.S.	380
26.	Westinghouse	U.S.	377
27.	3M	U.S.	374
28.	Mobil	U.S.	374
29.	Xerox	U.S.	353
30.	Hewlett-Packard	U.S.	327
31.	Ricoh	Japan	317
32.	Minolta	Japan	315
33.	Robert Bosch	Germany	313
34.	Royal Dutch Shell	U.K./Netherlands	310
35.	Sony	Japan	305

Source: Compiled by CHI Research, Inc.; U.S. Patent & Trademark Office.

1990 Japan Technology Imports

by Country, Percentage of 371.9 Billion Yen Total

Note: the Japanese source does not specify the nature of the "technology" commodity, but it is assumed to be intellectual property rights (royalties and licensing fees), not products.



Source: Government of Japan, Statistics Department

Prepared by the Office of the Assistant Secretary for Technology Policy

May 1993

Luncheon Speaker, Day Two

Technology Awareness

Mr. J. Richard Iverson, President and CEO, American Electronics Association

Technology awareness of world-class manufacturing technologies and capabilities is essential for the United States to compete in the 21st century. The collection, analysis, translation, dissemination and utilization of manufacturing technology need significant improvement in the United States if we are to be world-class competitors.

The AEA represents the overall electronics and information technology industries. We have a new view of the electronics industry which includes the industries served. The true importance of electronics to the U.S. economy can be seen in the attached "mandala" that illustrates the pervasiveness of electronics in other industries. Electronics and information technologies drive the process and product improvement in other sectors.

The reason we need to do much better in technology awareness and other aspects of the manufacturing and marketing process is clearly shown in **Chart 1**. In summary, the United States invented 29 of the 39 products shown. Japan only invented 2. The United States was first to market with 26 and Japan with 6. However, the United States is the market leader in only 12 products while Japan leads in 21 areas. United States invents -- Japan manufactures. Japan's market leadership in products the United States and Europe invent comes, in large part, from their international "technology awareness." The Japanese know how to find, retrieve, and effectively use foreign technologies. One measure of how Japan manages its technology are fees from technology licensing and royalties. In 1987, the data show that Japan obtained $1.35 billion in technology from the United States. The United States, in turn, obtained only $350 million from Japan.

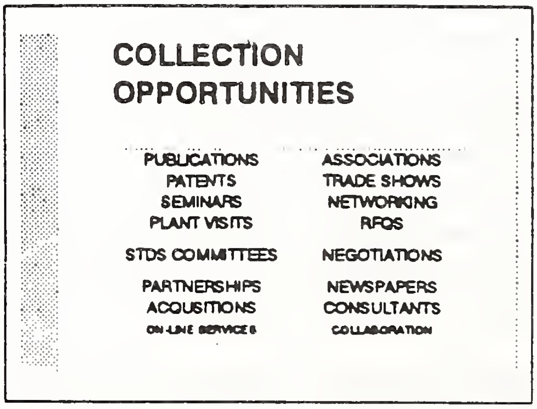
Japan has other advantages in manufacturing. A cohesive society allows efficient collection, dissemination, and utilization of manufacturing technology. Their government participates through tax incentives and many other ways to stimulate manufacturing. The Japanese are

excellent at incremental improvement of their processes, and the companies are dedicated to market share, which requires low-cost production and pricing policies to reduce competition.

Technology awareness for manufacturing requires data collection, analysis and translation, dissemination and utilization. The U.S. systems for each of these functions are embryonic, but growing rapidly. We must be world class in this area to win the global economic battle. There are many ways we could collect the technology information we need. One way is by individual companies for their use in their special manufacturing area. Some ways are systematic like NCMS.

It has been suggested that the U.S. government could provide a system to support our industries with the needed information. The CIA collects considerable information that could be useful in this effort. The collection system is in place. They are looking for a new mission. Many in industry fear this approach, but it could be readily implemented.

Some suggest having the U.S. Department of Commerce obtain information from all government and industry sources. The data would then be disseminated to all users without the sources being known. A new Agency for Information is another alternative. The opportunities for collection are great. They range from personal contact to on-line databases. The following table illustrates many sources.



AEA is an example of a trade association active in information collection. We have offices in Tokyo and Brussels. In Tokyo, where we have been for 9 years, we have an excellent American staff tracking technology developments in Japan. Office director John Stern reads 9,000 column inches of press monthly, and provides appropriate information back to the United States. He and his assistant, David Pollack, participate in many standards committees, trade shows, seminars, and other networking opportunities. Much valuable Japanese information is in the open literature but needs to be translated. An industry committee of over 180 U.S. companies offers additional potential.

Collaboration among companies, between companies and universities, and between countries provide good opportunities to obtain technology. The Intelligence Manufacturing Systems (IMS) initiative is a good example. Japan initiated the idea of cooperation between the United States, Japan, and Europe on manufacturing. The argument being that we are evolving into manufacturing globally, and technology commonality would be a benefit.

IMS is an initiative to determine the feasibility of international collaborative R&D in advanced manufacturing and its industrial development. This program will also demonstrate the ability to work together yet protect each other's intellectual property.

There are many online services that allow access to databases around the world. Japanese engineers use databases much more extensively than in the United States. We need to educate our companies about the availability of these services.

Japan represents the "best practices" in collection of manufacturing technology and its analysis, dissemination and utilization. Japan takes a systematic approach with industry and government working together. Japan learned technology collection after World War II through visits to United States factories with camera-bearing teams. Organizations like the Science and Technology Agency's Japan Information Center of Science and Technology (JICST) and MITI's JETRO have been around since the late 1950s, and have offices in many countries. Other organizations include MITI-sponsored trade associations such as Electronics Industries Association of Japan (EIAJ) that also have offices overseas.

Adding to the government efforts are the major companies and trading companies. Most have a mission to collect and rapidly transmit manufacturing technology back to Japan. Most have a mission to collect and rapidly transmit manufacturing technology back to Japan. Most Japanese managers work seven days a week, and the telecommunications lines are busy sending data every day. The Japanese transmit their data overnight, while data collected by the United States in Japan often takes several weeks to reach the appropriate manager.

There is a requirement to analyze the technology data collected worldwide. In many cases with Japan and Europe, we need to translate the information. Then we need to assess the impact the technology could have on applications that are determined.

The collection and dissemination in the United States is progressing. NCMS has an extensive library of manufacturing technology. The information is available electronically to the members of NCMS. They translate many Japanese reports and articles. The MCC has 6 researchers who monitor Japan and offer technical reports, presentations, consultations, and translation to its members. The National Science Foundation, Stanford University, MIT, the University of New Mexico, and many other American universities have programs to support technology collection efforts.

Once collected, analyzed, translated, and disseminated, industry has to utilize the information. Help can be obtained from the NCMS, Manufacturing Outreach Centers, and some associations. However, it is really up to the companies at this point to continually learn about, evaluate, and deploy the technology.

Today disk drives are manufactured for U.S. companies in Malaysia in high-skill, low labor-cost factories, and in Japan in automated factories. The Japanese recognized that automation was the only way they could compete with low-cost labor. The government of Japan provides excellent incentives for the use of robots as shown in the chart below.

As a result of these government incentives, the Japanese have 400,000 robots in use and the United States has 50,000. The Japanese competitively manufacture many products invented by the U.S. companies.

In conclusion, we must decide between low-cost, skilled labor or technology leadership in manufacturing. Since the former is unacceptable, we must improve and systematize our technology awareness throughout collection, analysis, dissemination, and utilization. The United States faces a big challenge in the next century to be the world leader in manufacturing.

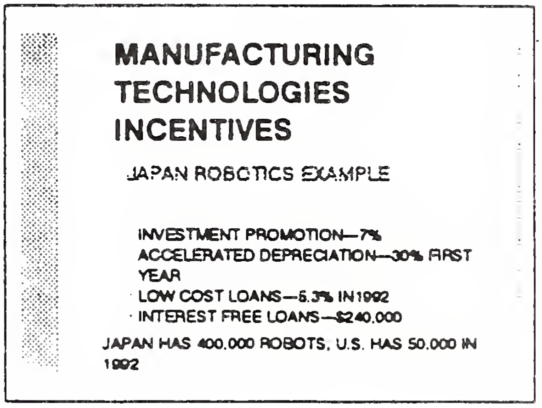
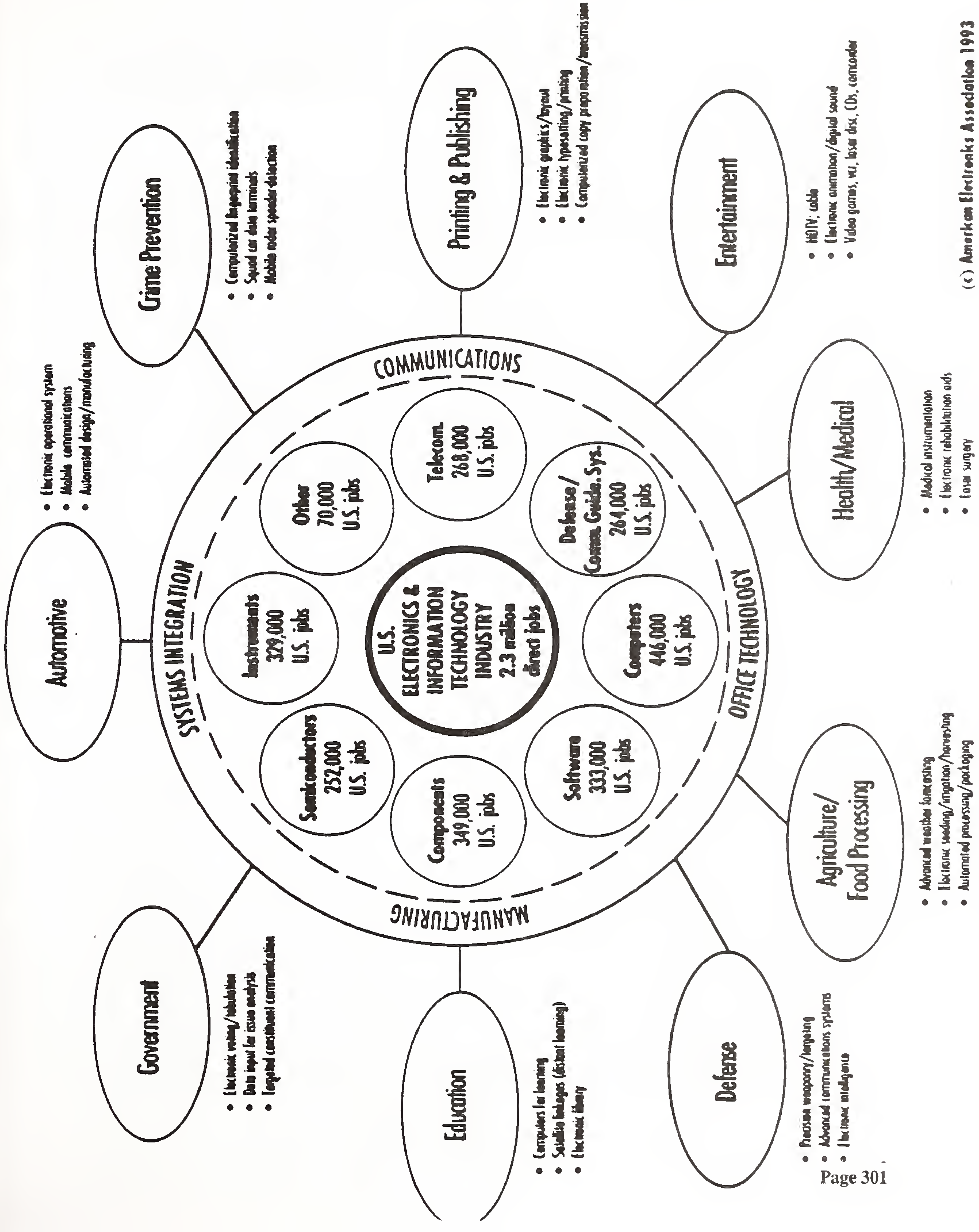


CHART 1

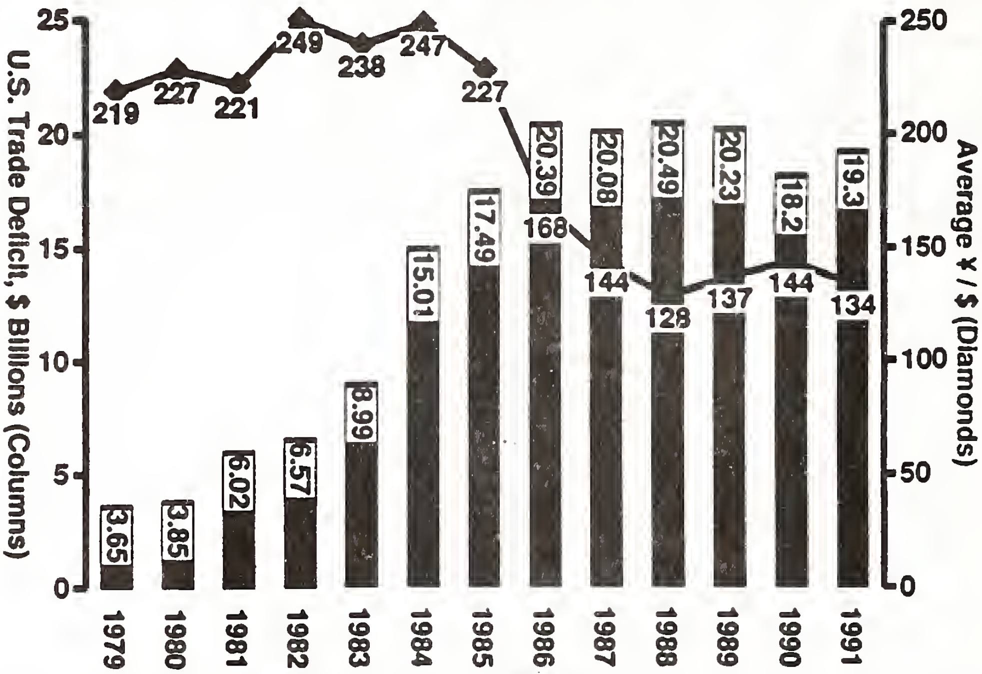
NATIONS AND CONTINENTS ORIGINATING BREAKTHROUGH R & D COMPARED TO THOSE FIRST COMMERCIALIZING PRODUCTS FROM THIS RESEARCH AND COMPARED TO THOSE FINALLY LEADING TODAY'S MARKET FOR THESE PRODUCTS*

Technology	Original R & D	First Products	Current Market Leader
Adv. composite materials	U.S.	U.S.	Japan/U.S.
Adv. electric-car batteries	U.S.	?	?
Anti-skid-brake autos	Europe	Europe	Japan/Europe
Auto-focus cameras	U.S.	U.S.	Japan
Automobiles	Europe	Europe	Japan
Biotechnology	U.S.	U.S.	U.S.
Commercial jet aircraft	Europe	U.S.	U.S.
Communications electronics	U.S.	U.S.	Europe
Compact-disk players	Europe	Europe	Japan
Computer-aided design	U.S.	U.S.	U.S.
Consumer electronics	U.S.	U.S.	Japan
Copiers	U.S.	U.S.	Japan/U.S.
Desk-top computers	U.S.	U.S.	Japan/U.S.
Digital watches	U.S.	U.S.	Japan
DRAM memory	U.S.	U.S.	Japan
Drugs and pharmaceuticals	U.S.	U.S.	U.S.
facsimile machines	U.S./Europe	U.S.	Japan
Fiber optics	U.S.	U.S.	U.S.
Flat-panel displays	U.S.	U.S.	Japan
Fuzzy logic	U.S.	Japan	Japan
Hand-held calculators	U.S.	U.S.	Japan
High-temp. superconductors	Europe/U.S.	Japan/U.S.	?
Integrated ckt. mfg. eqpt.	U.S.	U.S.	Japan/U.S.
Integrated ckt. test eqpt.	U.S.	U.S.	Japan
Jet engines	Europe	Europe	U.S.
Medical imaging technology	U.S.	U.S.	U.S.
Microprocessors	U.S.	U.S.	U.S.
Military radars	Europe	Europe	U.S.
Notebook computers	U.S.	U.S.	Japan
Num. cont. mach. tools	U.S.	U.S.	Japan
Rocket-propulsion tech.	Europe	Europe	U.S.
Robotics	U.S.	U.S.	Japan
Semiconductor lasers	U.S.	U.S.	Japan
Semiconductor materials	U.S.	U.S.	Japan
Software	U.S.	U.S.	U.S.
Supercomputers	U.S.	U.S.	U.S.
Television sets	U.S.	U.S.	Japan
Total quality management	Europe	U.S.	Japan
VCR's	U.S.	U.S.	Japan

Electronics Drives Product/Process Improvement in Other Sectors



U.S.-Japan Electronics Trade : The Durable Deficit



Representative Market Access Measure	*Year*
NTT Procurement Agreement	1981
Telecommunications Liberalization	1985
Plaza ¥ / $ Accord	1985
"Action Program"	1985
No Duty on Computers + Parts	1986
MOSS Agreements	1986
Semiconductor Agreement	1986
"Import Now"	1987
S & T Agreement	1988
Cellular Telephone Access	1989
Supercomputer Agreement	1990
Satellite Procurement Agreement	1990
Final Report, S.I.I. Talks	1990
Foreign Investment Reporting Eased	1991

AEA Japan Office May 19, 1993 10:37 AM

AEA Japan Industry Committee

Regular Members

as of September 1992

Acuson Nippon KK
Adobe Systems Japan
Allied-Signal Inc. Asia
Altera Japan KK
AMD Japan, Ltd.
American Software Japan
Ampex Japan, Ltd.
Anacomp (Japan) Ltd.
Analog Devices KK
Andersen Consulting
Andrew Int'l Corporation
Apple Japan, Inc.
Apple Op's & Tech's Japan
Applied Magnetics Japan,
Applied Materials Japan,
Applied Microsystems Japan
AspenTech Japan Co., Ltd.
AST Research Japan KK
AT&T Japan Ltd.
AT&T Jens Corporation
AT&T Paradyne Japan
Augat KK
Autodesk KK
Brooktree KK
Brush Wellman (Japan)
C•ATS Japan Inc.
Cadence Design Systems KK
Cambrian Systems Japan
Cascade Microtech Japan
Clearpoint Japan KK
Cognos Japan KK
Compaq KK
Comshare Ltd.
Conner Peripherals KK
CONVEX Computer Japan
Corning Japan KK
Cray Research Japan Ltd.
Cymer Japan Inc.
Cypress Semiconductor KK
Data Card Japan, Ltd.
Data I/O Japan Co., Ltd.
DDC Electronics KK
Dell Far East Corporation
Digital Equipment Corp. Japan
DSC Japan Incorporated
Du Pont Japan Ltd.
Dun & Bradstreet Software,
Dynisco, KK
Eastman Kodak Asia-Pacific
Echelon Japan KK
EEsof KK
EDS Japan, Ltd.
Emerson Japan, Ltd.
Emulex Corporation
Etec Systems Japan, Inc.
Fluke Corp.
Fusion Japan KK
GE Aerospace
Gould Electronics (Japan)
Gradco (Japan) Ltd.
GS-EE Co., Ltd.
GVG Japan Ltd.
Harris KK
Hewlett-Packard Labs Japan
Honeywell Asia Pacific Inc.
MEMC Electronic Materials
I.R. Far East Co., Ltd.
IBM World Trade Asia
IDT KK
Intel Japan KK
Internet Systems Japan, Ltd.
Keithley Instruments KK
KLA Japan Ltd.
Kulicke and Soffa (Japan)
Lattice Semiconductor
LeCroy Japan Corporation
Legent Software, Inc.
Logic Modeling Systems
Lotus Development Japan,
LSI Logic KK
Mark IV Audio Japan, Ltd.
Measurex Japan Ltd.
Medtronic Japan Co., Ltd.
Memorex Telex Japan Ltd.
Mentor Graphics Japan
Microsoft Co., Ltd.
MOD-TAP Japan
MOOG Japan Ltd.
National Semiconductor
Japan, Ltd.
NCR Japan Ltd.
Nihon BBN KK
Nihon Cisco Systems KK
Nihon Intergraph KK
Nihon Intermetrics KK
Nihon M/A-Com KK
Nihon Micro Technology
Nihon Microtec Research
Nihon Silicon Graphics KK
Nihon Sun Microsystems
Nippon Data Instruments,
Noran Instruments, Inc.
Northern Telecom Japan
NS CalComp KK
Olin Japan, Inc.
Oracle Corporation Japan
Overseas Bechtel Inc.
Pacific Telesis International
Quantum Japan Corp.
RAD Technologies, KK
Rasna Japan Corporation
Raychem, KK
Recognition Equipment
(Japan) Inc.
Reliability Japan Inc.
Rockwell International Japan
Rogers Japan Inc.
SDRC Inc.
Sequent Japan Tech's, Inc.
Siecor International Corp.
Silicon Valley Group, KK
SILVACO International
Spectra-Physics KK
SPSS Japan, Inc.
Square D Company Japan
Storage Technology of Japan
Tandem Computers Japan
Tekelec Ltd.
Tellabs International, Inc.
Teradyne KK
Texas Instruments Japan
Thomas & Betts Japan, Ltd
Trek Japan KK
Trimble Navigation (Japan)
TRW Overseas Inc.
Unify Japan KK
Varian Associates, Inc.
Veeco KK
Verbatim AA Co., Ltd.
Viewlogic Systems Japan
VLSI Technology KK
Western Digital Japan Ltd
WordPerfect Japan
XILINX KK
Yokogawa Hewlett-Packard

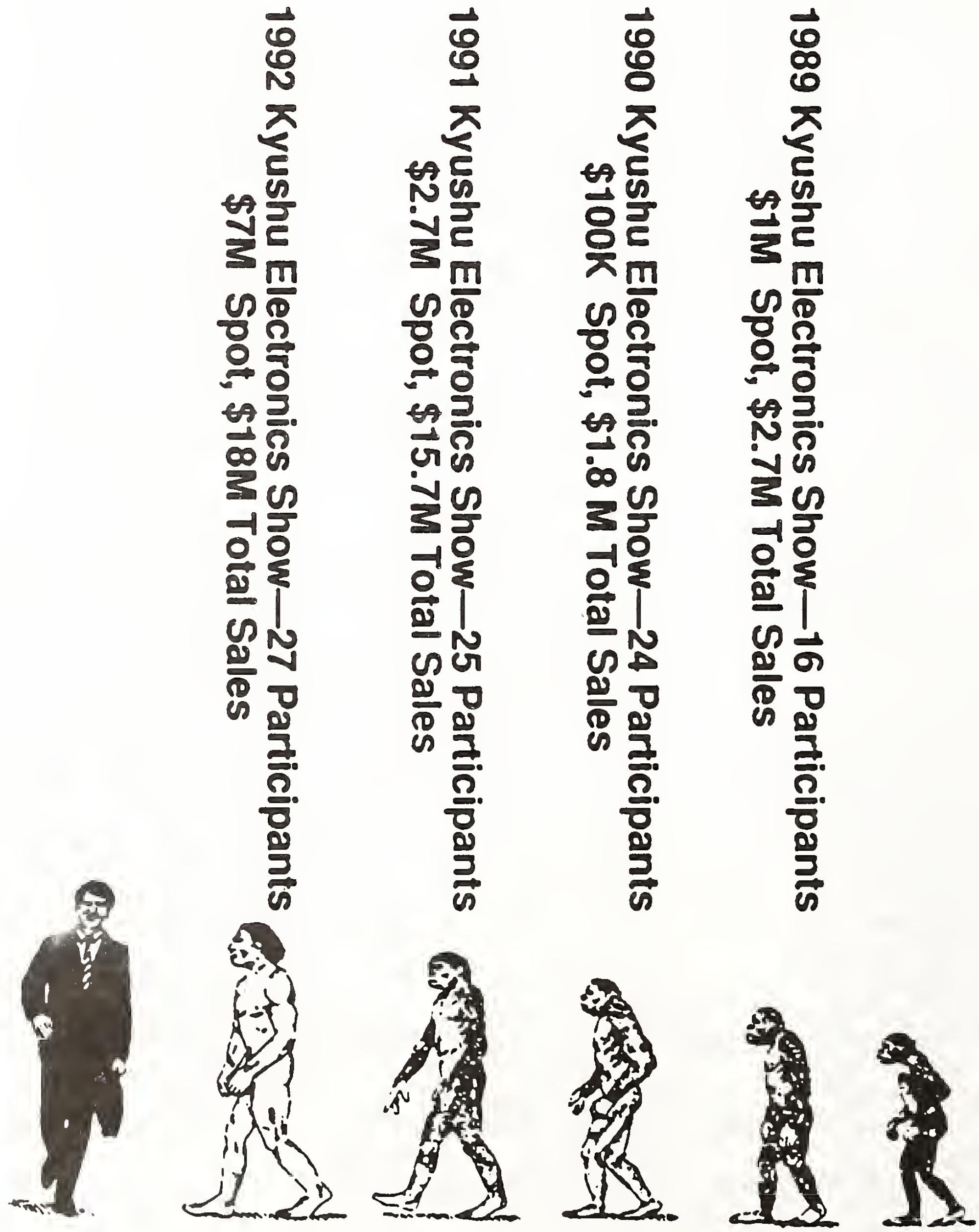
AEA: Evolving Market Opportunities

Four Years Of Kyushu Electronics Shows

AEA (Company-Paid) Investment: $138,422

AEA (Company-Received) Sales: $49,000,000

AEA-Generated Return on Investment: 353.98 Times



"WINDOW TO JAPAN" PUBLICATIONS

- DIRECTORY OF AMERICAN ELECTRONICS COMPANIES IN JAPAN
- SOFT LANDING IN JAPAN: A MARKET ENTRY HANDBOOK FOR U.S. SOFTWARE COMPANIES
- SOFTWARE PARTNERS: THE DIRECTORY OF JAPANESE SOFTWARE DISTRIBUTORS
- DIRECTORY OF JAPANESE PROCUREMENT OFFICERS

Part VII. Developments in Computer-Assisted Access

The Joint Research Project for a Retrieval System for Overseas Users of Japanese Databases

Mr. Keisuke Okuzumi, Promotion Director, Database Promotion Center (DPC), Japan

In October 1992, the number of databases available in Japan totaled 2,686. Of this number, 892 were produced by Japanese companies. Foreign databases, mainly from the United States, still numerically but not financially dominate the Japanese market. Of the Japanese-produced databases, 290 are accessible to overseas users. Only 100 of these databases, however, provide English-language versions. Japan databases are extremely difficult to search by potential non-Japanese speaking users without the help of some translation expertise.

In order to distribute more Japanese information overseas through databases, the Database Promotion Center (DPC) believes that the number of Japanese databases translated into English must be increased. This is difficult for Japanese database producers and vendors because there are significant problems, such as high translation costs, uncertain consumer demand in foreign countries, and time-lags between data creation and distribution.

In addition, according to studies made by the DPC (for example, *Overseas Needs for Japanese Information and Databases*), actual users pointed out the following deficiencies of Japanese databases: 1) full-text databases are not available; 2) abstracts in English are not well prepared; and 3) information can be incomplete.

Although, some Japanese-to-English machine translation systems have been commercialized, many problems remain to be solved. Fundamental problems of accuracy, performance, and limited translation domains remain unresolved. Further technological advances in areas such as information technology and natural-language processing promises to improve the quality of future machine translation systems.

On the other hand, the increasing number of people who understand the Japanese language, coupled with PCs capable of handling Japanese characters, (such as Macintosh Kanji-Talk and IBM (or IBM-compatible) DOS/V, is making it easier for non-Japanese speakers to process Japanese more easily and cheaply.

In an effort to avoid costly translation expenses and improve Japanese information distribution, given the low hit rate on most databases, the DPC began to study multi-lingual, front-end retrieval systems for foreign users to search through Japanese databases.

This project was initiated by MITI in 1990, with a report titled *Research Survey of Japanese Databases in the U.S.* The aim of the study was for Japanese information database producers to better understand the needs and requirements of the corporate and individual users of Japanese databases.

In order to solve the problems identified in the report, the DPC planned the development of a Multilingual FEP Retrieval System (herein the Project). In May 1992, MITI proposed at the Third International Conference in Science, Technology and Commerce at Nancy, France, to develop this system as an international project Immediately, the European Association of Japanese Information Agencies (EURAJIN), agreed to join the project.

In July 1992, the DPC organized a committee to oversee the Project. The committee's chair is Professor Takeshi Hiromatsu of the University of Tokyo, and members include representatives from JICST, JAPIO, NIKKEI, NACSIS, database producers, software development companies, and members of EURAJIN living in Japan. The main activities in 1991 were to define the scope of the Project and to survey the design details and demands for the system.

At the same time, MITI began to research an English-Japanese multilingual thesaurus for business information subjects. Being an important participant of the project, Professor Syuichi Ueda of Keio University, was appointed the head of research.

In 1992, the DPC committee sent a group to the United States to discuss the feasibility of the system with people interested in Japanese information at the University of Wisconsin, New York University, MIT, and Harvard. MITI also started the second phase of its project to build an

experimental multilingual thesaurus based on the NIKKEI thesaurus (Japanese version) which is composed of industry, economic, and other business related subjects. This trial is the first time the Japanese government has attempted to compile a multi-lingual thesaurus dealing with business information. The expectations for this thesaurus are great.

In 1993, the Project enters the final stage. In development is an applications software that uses the thesaurus mentioned above and based on a similar program which is already in use for searching English-language Databases in Japanese. This system will be tested in Japan first by using the *NIKKEI TELECOM*. After those then hope to demonstrate this system at exhibitions or conferences held outside of Japan.

Outline of the Multi-lingual FEP Retrieval System

The system designed will have the following functions:

Searching commands based on ISO or CCL which can be inputted with English-language keywords whereby the corresponding Japanese and English is provided from a keyword list.

The system will display this thesaurus in English and Japanese, so that it can clarify the concept and structure of the Japanese keyword. The thesaurus has scopes and comments for each keyword, so that the user can better understand the meanings of the Japanese keyword.

The selected Japanese words are then compiled into a search format and then sent to the service system. The searching method will result with a Japanese output, but the messages from the system will be translated into English.

The user will be able to access Japanese databases more easily and efficiently as well as obtain full-text information in Japanese with the use of this system. In additional, after the process of down-loading, a user will be able to access into a Japanese-English machine translation system on own PC.

Special Features of the System

The system has the following features that take special regard for overseas' user needs:

- Hardware and Software

  Hardware; IBM or IBM compatible

  (easily bought overseas)

  Software: DOS/V and Japanese WINDOWS

  (developed by IBM Japan)

- Utilization of the Thesaurus

  The multilingual thesaurus makes it easier to select keywords and to better understand the concepts and contents of Japanese keywords.

- Command Standardization

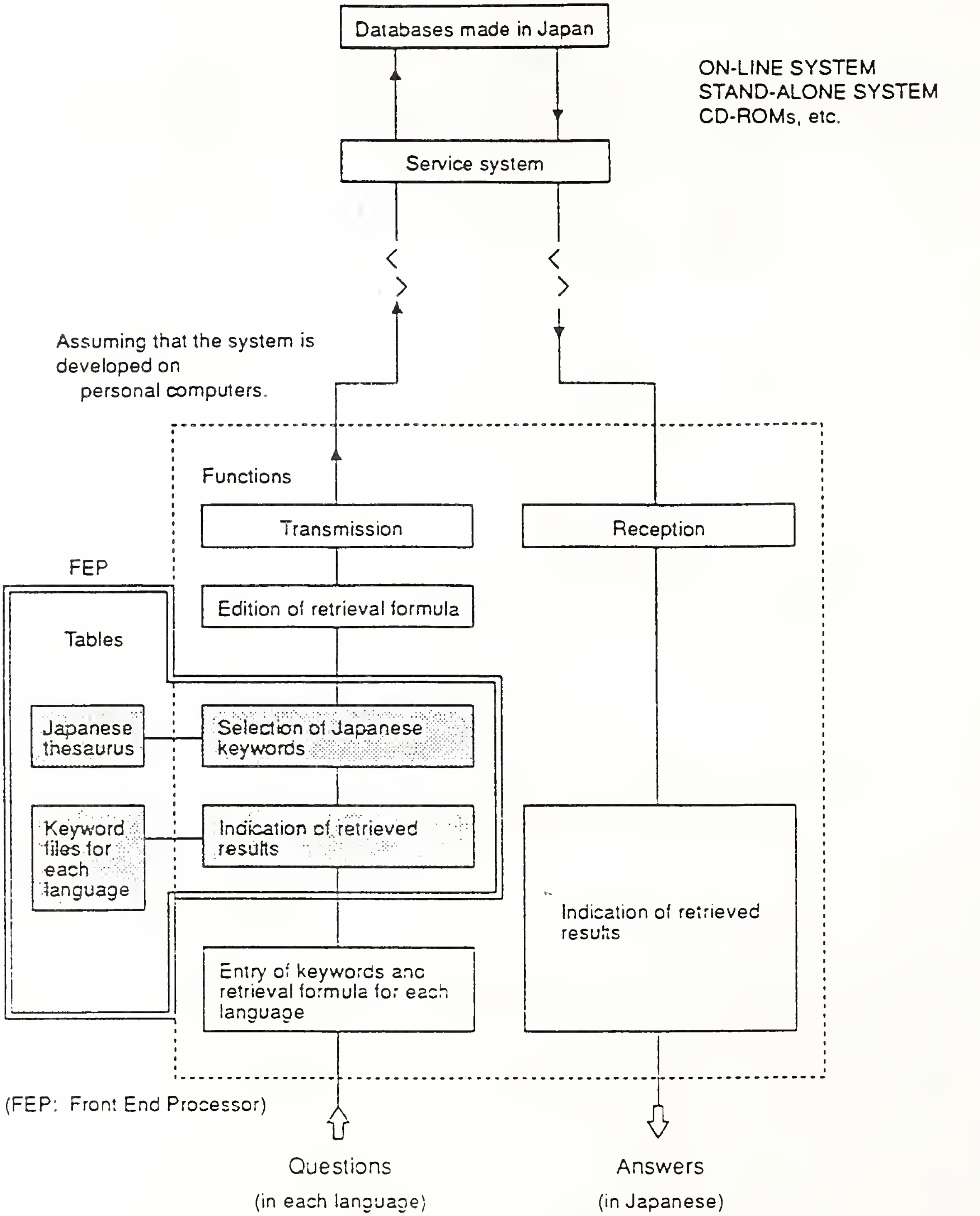
  Introducing ISO Standard

  Automatic conversion from ISO format to the format of the individual service system

Conclusion

This system is only an experimental one. The DPC does not intend to commercialize it immediately. Building keyword files and thesauruses that cover all subjects will require a huge budget and time commitment. The same reasons stand for the creation of a table to convert commands to be used by individual service systems.

We, at the DPC, hope, however, that the Japanese database vendors will overcome the language barrier by utilizing the results of our experimental system. Lastly, this project is not only a Japanese effort, but one that includes the efforts of non-Japanese people from the United States and Europe. Throughout this project we have made many friends and gathered tremendous amounts of information; for this we are grateful.



System Structure

Retrieval of Japanese Scientific and Technical Information from the JICST Online Information System (JOIS)

Professor James L. Davis, (Technical Japanese), Department of Engineering Professional Development, University of Wisconsin-Madison and Ms. Efrat Livny, Director, BioInformation Facility, University of Wisconsin Biotechnology Center

JICST is a special, non-profit corporation affiliated with the Science and Technology Agency (STA) of the Japanese government. Since 1957 JICST has been charged with collecting scientific and technical information on a worldwide scale, processing this information systematically, disseminating the information rapidly and appropriately to users, and cooperating with similar organizations throughout the world [Endnotes 1, 2]. The principal services provided by JICST are abstracting, publication of these abstracts, maintaining an online database, publishing reference materials for efficient use of the database, document searching and photocopying, and document translation. For potential users outside Japan, the most important of these services is the online database service, known as the JICST Online Information System (JOIS). This service, which began operation in 1976 and became available to overseas users in 1985, provides access to many of the files maintained by JICST and to certain files maintained by other organizations but distributed by JICST. A partial list of the files available to users in the United States appears in Reference 2. Any of these files can be accessed by opening an account with JICST and by establishing the proper communication links. Guidelines for obtaining access to JOIS using hardware and software readily available in the United States appear in Appendix A.

JOIS Files

Once access to JOIS has been obtained, it is necessary to select the files to be searched and to construct a search strategy for each file. By far the largest file is the JICST File on Science and Technology (JICST, File 010).

This file includes more than six million citations drawn since 1981 from journals, reports, and conference preprints around the world. A typical search plan using JOIS would probably include searching the JICST file as well as other specialized files that would be appropriate for the specific topic under consideration.

One file that is particularly useful for tracking current technical progress in Japan is the *Nikkan Kogyo File* on New Technology and Products in Japan (NK-MEDIA, File 070). Citations in this file are drawn from the database compiled by the *Nikkan Kogyo Shimbun,* one of the major industrial newspapers in Japan. This file includes citations from 1983 to date.

Most of the files on JOIS have been designed to be searched in Japanese. The JICST File on Science, Technology and Medicine in Japan (JICST-E, File 510), however, is an English-language file that is devoted exclusively to citations published in Japan. This file extends back to 1985, and includes citations drawn from both the JICST File on Science and Technology (File 010) and the JICST File on Medical Science in Japan (File 050). The JICST Quick File (JQUICK, File 030) may also be searched in English. The citations contained in this file will ultimately become part of the JICST file, but are gathered here in abbreviated form (titles and bibliographic data only; no key words) to provide more rapid access to recently received documents. Citations in this file date back to 1990, but the real benefit from this file is gained for citations dating back in time about six months from the date of searching.

Many citations in the JQUICK file include English titles and some citations also include English abstracts written by the author(s). The other files on JOIS are also valuable, but further discussion in this paper will be restricted to the four files described here.

Example Search

The most effective way to describe our experience using JOIS is to provide an example. The topic selected for this example is that of conducting polymers and polymer batteries. The search consists of two sections: part A includes terms that are related to the general concept of conducting polymers, part B contains terms that are related to

polymer batteries, which represent one of the most important industrial applications for conducting polymers. A list of terms to be used for a Japanese language search was compiled, and is shown as Figure 1. A corresponding set of terms to be used for an English-language search appears in Figure 2. In compiling these lists it was of course necessary to know the Japanese and English terms that are commonly used by specialists in the field, and to translate each term into the other language as accurately as possible. It was also important to include the specific terms related to this topic that appear in the controlled vocabulary of key words (descriptors), both in Japanese and in English. In this regard the reference works [Endnotes 3-12] published by JICST were indispensable. Those terms in each language that are included in the *JICST Thesaurus* (Japanese or English) are indicated with a star. Normally, when searching any of the files on JOIS, our initial iteration includes a search of controlled terms (keywords), free terms, and single words from the title and abstract of each citation in the file. The keywords are those terms listed in the JICST Thesaurus, and appear within the KW field; free terms are words added by the abstractor and appear in a separate FT field.

The importance of including in the list of search terms the appropriate terms from the *JICST Thesaurus* cannot be overemphasized. In this example, although the most common term used in the United States to describe such materials may be "conducting polymers" or "conductive polymers," the official JICST term is "electroconductive polymer." Failure to include this specific term in the list of search terms allows the possibility of overlooking potentially valuable citations for which the desired term appears only in the KW field. Some searches produce disappointing results for exactly this reason.

Search Results

Once the list of search terms for this example had been compiled, a very simple search strategy was established. The citations identified using each term were linked with a logical "or" to obtain a subtotal for part A and another subtotal for part B. Parts A and B were than joined with another logical "or" to obtain the total number of citations for the topic. The Japanese search was carried out on three files: the JICST file (010), the JQUICK file (030) and the NK-MEDIA file (070). The English search was conducted using the JICST file (010), the JQUICK file, and

the JICST-E file (510). The results for the Japanese searches have been compiled in Figure 3; the results from the English searches appear in Figure 4. Because the JICST file and the JQUICK file both contain citations published outside Japan, the number of citations identified for each term was reduced by restricting the search to citations published in Japan (NA = JPN). Thus, all of the numbers that appear in Figures 3 and 4 refer to citations originating in Japan. In order to fairly compare the results of these searches, some additional information about each file is necessary.

Figures 5 and 6 provide some information about the various files and about the fields that are likely to be present in a citation drawn from each file.

Although this is not stated in Figures 5 and 6, each Japanese file does, of course, provide a Japanese title for each citation. Where a number is given as a percentage, the percentage applies to the entire file, regardless of the search strategy or topic. Where numbers are presented as a ratio, the result shown is simply the result for the citations found in 1992 for the particular search strategy employed in this example. Other searches on other topics may yield quite different results.

Because of the different years included in different files, a year-by-year comparison is instructive. Figures 7 and 8 display the total number of citations identified in each file for each year, beginning with 1992 and working back to 1985. The percentage of Japanese language records is also indicated for each year. The total number of citations identified in each file from 1985 to date is also included. The nominal starting date of the JICST-E file is January, 1985, so any comparison extending earlier than 1985 has no real meaning.

The intersection between selected pairs of searches is displayed in Figures 9 (NA = JPN) and 10 (LN = JA). In each case, the total number of citations identified by a search in Japanese is compared with the total number of citations identified by a search in English. These citations are then classified according to whether the citation was included only in the Japanese language search, only in the English-language search or in both the Japanese and English-language searches. The percentage shown for each comparison indicates the degree to which the English

search identified the documents that would have been identified had the search been carried out in Japanese using the JICST file as a reference.

Analysis

The key issues to be addressed are selecting the correct search terms, constructing a complete search strategy and deciding which file(s) to search in which language.

For both the English and Japanese searches the vast majority of the citations

were identified using the keywords contained in the controlled vocabulary (Figures 3 and 4). It is important to note that in the JICST-E file each controlled term consisting of two or more words **must** be entered as a unit rather than as the intersection of two or more individual words. The use of truncation symbols during the search similarly causes the computer to overlook citations for which the only hit that might otherwise occur results from the appearance of the term in the keyword field. Thus, in this example "electroconductive polymer" yielded 1786 citations, but "electroconductive[W]polymer&" yielded only 96 citations. "Polymeric semiconductor" produced 78 citations, but "polymer&[W]semiconductor&" failed to produce a single citation (Figure 4).

The number of terms required in Japanese to adequately express a fixed number of English terms varies tremendously depending upon the topic. The widespread use of *katakana* in certain technical fields means that some English terms could be expressed in a *kanji* representation and in a *katakana* representation.

In other situations one Japanese term may correspond to several English terms. Thus, it is necessary to include in both lists of search terms the terms preferred by specialists in the field, as well as literal translations of terms from the other language and the translations recognized in the *JICST Thesaurus*. Failure to do so could seriously limit the number of citations produced, and reduce the value of the entire search exercise.

In this specific example, the bulk of the citations identified in the total search came from Part A, regardless of the file or language used. Of the 2756 citations identified in Part A when searching the JICST file in Japanese, 79 percent were Japanese language records. Of the 118 citations identified in Part B of the same search, 94 percent were Japanese language records (Figure 3). This is consistent with the general tendency to encounter a higher percentage of English language records when dealing with more fundamental or basic topics, and a higher percentage of Japanese language records when dealing with applications of a technology to a specific product. Part A included citations from a wide variety of sources: technical journals, conference preprints, government or technical society reports, and some trade journals. Part B included mostly citations from trade journals, which are quite naturally written in Japanese. All of the citations contained in the NK-MEDIA file are Japanese-language citations, since the *Nikkan Kogyo Shimbun* is a Japanese-language newspaper.

Almost all of the citations identified when searching the JQUICK file in Japanese were Japanese-language citations (99 percent), although the percentage of Japanese-language records found when searching the JQUICK file in English (83 percent) or when searching the JICST-E file (77 percent) were close to the percentage for the Japanese language search of the JICST file (79 percent). It should be noted that the value of the JQUICK file lies in the brief lag time between appearance of the original document in print and the inclusion of the citation in this file. In fact, of the 110 citations identified for 1992 by the Japanese language search in JQUICK, 43 citations were newer than the most recent citation identified by the Japanese language search in the JICST file.

Similarly, of the 85 citations identified for the same year by the English-language search in JQUICK, 38 were more recent citations than the most recent citation produced by the English language search in the JICST-E file. The drawback associated with this major shortening of this delay comes from the fact that this file contains no keywords, and the percentage of records containing abstracts or an English title varies tremendously according to the search topic and the search language used.

In the present example, of the citations produced when searching the JQUICK file in English all of the records included English titles, less than 10 percent contained Japanese abstracts and more than a third

contained English abstracts. Thus, if a citation did not contain an English title, it is unlikely that a search of the JQUICK file in English would have produced that citation. In contrast, of the citations identified when searching the JQUICK file in Japanese only about half included English titles, roughly one third contained Japanese abstracts and about 10 percent included English abstracts. The inherent variability of citations in this file makes clear the danger associated with making assumptions about the characteristics of the Japanese-language citations based only upon a search in English. The completeness of the citations and the high level of quality control associated with the JICST file make this file the standard against which to measure all of the other files available through JOIS.

The number of records produced by the search of the JICST-E file reached 84 percent of the total number of records produced by searching the JICST file in Japanese (2364 vs. 2815). If the range of the search is restricted to cover 1985 to the present, this percentage rises to 98 percent (2301 vs. 2339). The degree of coverage of the JICST file by the JICST-E file thus appears to be extremely high. The actual overlap between these two searches will be discussed in more detail later. All of the other searches produced far fewer citations. The real value of the NK-MEDIA file and the JQUICK file however, is not their size, but results from the ability to access citations with a lag time that is shorter than that associated with the JICST file.

In Figures 7 and 8 the numbers of citations produced year by year in several of the JICST files are listed. *Taking the Japanese search of the JICST file as a standard, it is clear that there is almost no value in searching the JICST file in English.* Of course, that is not the purpose of that file. The JICST-E file was designed specifically for searching in English, and an English language search of the JICST-E file consistently produced year by year the same number of citations (plus or minus 5 percent) as a Japanese-language search of the JICST file. The degree of overlap between the Japanese-language search of the JICST file and the English-language search of the JICST-E file for 1992 is shown quantitatively in Figures 9 and 10. The use of the same citation numbers in the JICST file and the JICST-E file makes analysis of this overlap quite simple to carry out. The existence of some citations that were identified in only the Japanese-language search or only in the English-language search meant that 89 percent of the citations identified for 1992 were in fact common to both sets (Figure 9).

The 24 citations that appeared only when searching in Japanese were produced because search terms appeared in the abstracts of these citations. Figure 6 indicates that only about half of the records produced from the JICST -E file contained abstracts. Raising the percentage of citations in JICST-E that included abstracts would certainly reduce the number of citations that appeared only in the Japanese-language search of the JICST file. The eight citations that were identified only by the English-language search were picked up because search terms appeared in the English abstract, but not in the Japanese abstract. This percentage is quite small, however. A comparison of Figure 9 with Figure 10 suggests that whether the original document was written in English or in Japanese, there is no significant effect on the percent coverage in the comparison searches.

Searching JICST-E on STN

A further comparison that would also be of interest to many potential users of the JICST database is the comparison between a search of JICST-E direct from JOIS and a search of JICST-E as it is distributed by STN. STN (Scientific and Technical Information Network) is operated jointly by JICST, the Chemical Abstracts Service and FIZ Karlsruhe. Among the many files available from STN is a derivative of the original JICST-E file compiled by JICST. The JICST-E file available through STN contains for each citation the same information included in the JICST-E file available through JOIS, with the addition of one new field: broad terms (BT). The terms in the BT field of JICST-E on STN are taken from the *JICST Thesaurus*. The use of broad terms in the search list allows the user to retrieve records that contain all of the narrow terms that are grouped together under that broad term.

For example, the use of "solid electrolyte" in the search list employed on STN would produce all of the records that contained as a keyword "superionic conductor," in addition to all of the records that contained "solid electrolyte," because "superionic conductor" is a narrow term that is included under "solid electrolyte" according to the JICST Thesaurus. This BT field appears only in the version of JICST-E distributed by STN. In the example presented in this paper, the presence of the BT field had no impact on the number of citations produced, since the only search terms that qualified as broad terms were "polymeric conductor" and "organic conductor." The only narrow

terms that fall within the scope of these broad terms are "polymeric semiconductor" and "organic semiconductor," respectively, but both of these terms were already included in the initial search strategy. In some searches the effect of the presence of the BT field in the JICST-E file available through STN would be to increase the number of citations identified using the same search for JICST-E on STN to a number higher than that produced by the same search for JICST-E on JOIS.

In this specific example the results obtained when searching JICST-E through STN have been included in each figure along with the results obtained when searching JICST-E through JOIS. Over time the number of citations obtained via STN match almost exactly the number of citations obtained via JOIS (Figure 8).

However, a difference did appear for 1992. For 1992 there were 16 citations that were identified by both the Japanese language search of the JICST file and the English-language search of the JICST-E file on JOIS that were not identified by the English-language search of JICST-E on STN. When the specific citation numbers for these 16 citations were called up on STN, the system responded that these records did not exist in this database. Thus, there is some period of delay between the time a citation appears in JICST-E through JOIS and the time that the same citation appears in JICST-E through STN. In this particular example the difference between the results obtained using these two versions of JICST-E amounted to 6 percent of the total number of citations identified in the Japanese-language search of the JICST file (Figure 9). With the passage of time it is clear that this difference disappears.

Summary

It is possible to access the JOIS database service from the United States using hardware and software that are readily available in the United States.

In general, a search of the JICST file (file 010) in Japanese is the best way to obtain the most complete coverage of those citations produced in Japan that are included in the JICST database. Other files may also be searched depending upon the specific topic and the type of publication that the user desires to cover. (The JICST database does not

include patents.) A well-constructed search of the JICST-E file (file 510) in English may retrieve as many as 90 percent or more of the citations identified by the Japanese-language search in the JICST file. This figure will vary significantly depending upon the specific topic and the success in constructing an English-language search that is truly equivalent to the Japanese-language search. An English-language search of the JICST-E file available through STN may retrieve as many as 90 percent of the citations identified by the same English-language search of the JICST-E file through JOIS. Other files, such as the JQUICK file and the NK-MEDIA file, complement the JICST file by providing more rapid access to citations that will eventually become part of the JICST file, or by searching a different body of information coming from one of Japan's or U.S.'s major industrial newspapers.

Caution is necessary when comparing searches carried out in different languages through different files. Rigorous use of the *JICST Thesaurus* will minimize the likelihood of overlooking potentially valuable citations, regardless of the file or search language employed.

References

1. *National Laboratories and Public Research Organizations in Japan,*Research Development Corporation of Japan (JRDC). Tokyo, Japan. 1991

2. *JICST 1991.* Japan Information Center of Science and Technology. Tokyo, Japan. 1991.

3. *JOIS-III Guide.* Japan Information Center of Science and Technology. Tokyo, Japan. 1990.

4. *JOIS Katsuyo no Tebiki. I. Komando Kaisetsu.* Japan Information Center of Science and Technology. Tokyo, Japan. 1991.

5. *JICST Kagaku Gijutsu Yogo Shisoorasu.* Japan Information Center of Science and Technology. Tokyo, Japan. 1981.

6. *Nichi-Ei Taiyaku Risuto.* Japan Information Center of Science and Technology. Tokyo, Japan. 1987.

7. *Ei-Nichi Taiyaku Risuto.* Japan Information Center of Science and Technology. Tokyo, Japan. 1987.

8. *JICST Thesaurus -- English Version,* Vol. 1. Japan Information Center of Science and Technology. Tokyo, Japan. 1987.

9. *JICST Thesaurus -- English Version,* Vol. 2. Japan Information Center of Science and Technology. Tokyo, Japan. 1987.

10. *JICST Thesaurus -- Subject Category Index.* Japan Information Center of Science and Technology. Tokyo, Japan. 1987.

11. *JICST Classification Table.* Japan Information Center of Science and Technology. Tokyo, Japan. 1987.

12. *JICST Thesaurus Permuted Index.* Japan Information Center of Science and Technology. Tokyo, Japan. 1987.

Appendix A

Guidelines for the Retrieval of Japanese Scientific and Technical Information from the JICST Online Information System (JOIS)

Prepared by

Prof. James L. Davis, Department of Engineering Professional Development, University of Wisconsin-Madison, 1527 University Ave., Madison, WI 53706, (608) 262-4810
and
Ms. Efrat Livny, BioInformation Facility, University of Wisconsin Biotechnology Center 1710 University Ave., Madison, WI 53705, (608) 262-1966

(I) System requirements:

(1) Hardware:

- Macintosh or PC
- Modem (1200 or 2400 baud)

(2) Software:

- Japanese system software:
  Macintosh: Kanji Talk
  PC: IBM DOS J5.0/V or MS-DOS
- Communication software:
  Macintosh: Ninja Term or EG Talk or Terminal-J
  PC (using DOS V): Procomm or Nihongo Microsoft Windows
  PC (using MS-DOS): KCOM2
  * Note: Regardless of platform, when searching in Japanese the communication software must be able to send Japanese text using old-JIS or new-JIS code.
- Japanese word processing software:
  Macintosh: Solo Writer or EG Word or MacWrite II-J
  PC (using DOS V): Nihongo Microsoft Windows
  PC (using MS-DOS): KCOM2
  * Note: Regardless of platform, when searching in Japanese a front end processor (FEP) for kana input is necessary.

(II) Access requirements:

(1) Establishing a JICST account

- All U.S. JICST accounts are established by the National Technical Information Service (NTIS) at the Department of Commerce.
- In order to become a registered user call or write your request to:
  National Technical Information Service
  Attn: International Agreements
  U.S. Department of Commerce
  Office of International Affairs (OIA)
  5285 Port Royal Road, Room 306F

Springfield, VA 22161
Phone: (703) 487-4819
Fax: NTIS: (703) 321-5476 OIA:7-4-321-8199

- Key contact: Barbara Payne (703) 487-4826

- NTIS will mail you an Online License Agreement which will need to be signed by an official representative of your organization. The agreement is to be returned to NTIS.

- NTIS will obtain from the Japanese JICST office and provide to you the following:
  1. New User Code
  2. New Master Password
  3. Documentation - *Handling Of JOIS Master Password*
  4. Documentation for searching (in English) - *JOIS-III Guide*

- This process takes up to several weeks.

- NTIS does not charge for this service.

- There are no charges for setting up and maintaining a JICST account; users are only billed for actual use.

- Billing is handled by NTIS in dollars.

- A JOIS Database and Price List is available from JICST.

<u>(2) Establishing international network access to Japan</u>

- Access to JOIS is handled by BT (British Telecommunications) TYMNET. TYMNET connects the U.S. user to the Japanese KDD network that operates VENUS P, a packet switching network through which the JICST Online Information System (JOIS) can be accessed.

* Note: There is no connection to JOIS via TYMPAS, TYMNET-Japan or NIS.

- In order to become a registered user a written request should be mailed or faxed to:
  BT North America Inc.
  33533 West 12 Mile
  Suite 100
  Farmington Hills, MI 48331
  Phone: (313) 932-4870
  Fax: (313) 932-4882

- Key contacts: Tom Erdman, Cheryl Lott (313) 932-4862

- The following items should be requested of BT North America:

  1. A user name and password.
  2. The local telephone number for TYMNET for your location. (Be sure to indicate the baud rate for the modem you will use.)
  3. Documentation for access procedures, services and fees.

- BT North America will provide you with the following:

  1. User name, Network User Identity (NUI, beginning with T.JAPAN).

2. Password (beginning with TYM).
3. Local phone number for TYMNET (for the baud rate specified by you).
4. User documentation - *How to Use TYMNET Asynchronous Access.*
5. Billing information - *Customer Billing Guide.*

- This process takes up to several weeks.
- There are charges for setting up and maintaining a BT TYMNET account .
- Monthly maintenance fees are charged even if the network is not used. These charges are separate from the JICST search charges and are billed monthly.

(3) Other important information:

a) JOIS availability :

- Refer to the *JOIS-III Guide*, and convert the Japanese time to local time.

* Note: Service is not available on Japanese national holidays in addition to the dates specified in the *JOIS-III Guide.* A complete list of these dates is available from NTIS.

b) Terminal settings for searching:

- When logging in, the following settings are needed:
  Modem: VT 100 mode without a local echo.
  Data length: 7 bits
  Parity : even
  Stop bit: 1
  Flow control: on
  Baud rate: 300, 1200 or 2400

- For additional details, refer to *How to Use Tymnet*, page 1.

(III) Access procedure:

(1) Entering JOIS via BT TYMNET:

Dial the local TYMNET number "ATDT __________"

For Macintosh with Kanji Talk type "O" for terminal identifier

Enter NUI (Network User Identity) "T.JAPAN_______"

Enter Password provided by BT TYMNET "TYM_______"

Enter host address "44013135780"

(2) Logging into JOIS:

In response to "Please enter (JOIS, STN, JOISF):" type "JOIS"

In response to "Enter terminal id" hit CR

a) On first login only:

In response to "JICST on-line service" type "\JOIS E ###-####m,name"
"E" provides screen messages in English.
"###-####" represents the U-ID (user identification number).

"m" indicates that you will change the master password to your own password.
"name" is the name assigned to the searcher (1-20 characters).
* Note: Do not add any extra spaces.

In response to "Please enter master password" enter 9-digit master password, then hit CR

In response to "Enter $PAS or \JOIS", enter "$PAS 9999"

In response to "Please enter password" enter your own password (1-8 alpha-numeric characters)

In response to "Enter ¥JOIS command" type "\JOIS E ###-####,name"
"E" provides screen messages in English.
"###-####" represents the U-ID (user identification number).
"name" is the name assigned to the searcher (1-20 characters).
* Note: Do not add any extra spaces.

In response to "Please enter password" enter your own password

b) On subsequent logins:

In response to ""JICST on-line service" type "\JOIS E ###-####,name"
"E" provides screen messages in English.
"###-####" represents the U-ID (user identification number).
"name" is the name assigned to the searcher (1-20 characters).
* Note: Do not add any extra spaces.

In response to "Please enter password", enter your own password

(3) Beginning a search:

Change your communication software settings to create a local echo. JOIS will not automatically echo back your input.

Select the file to be searched. A complete list of files is included in the *JOIS-III Guide*.
* Note: The JICST file (file 010) can be searched in English or in Japanese. The JICST-E file (file 510) is a better alternative when searching in English.

When searching in Japanese the communication software may be set for either new JIS or old JIS code. The old JIS code is recommended. The carriage return should be set for 7 bit kana.
Note: Neither shift-JIS nor EUC can be used, since neither provides the carriage return setting for 7 bit kana.

When searching in Japanese the word processing software must be set to input the search terms in half-size katakana. JOIS will not accept search terms input in kanji, hiragana or full-size katakana.
* Note: Following input in half-size katakana the echo on the screen may look like garbage, but the system will respond with the proper Japanese term and the number of records.

Refer to the *JOIS-III Guide* for information on conducting a search, viewing the results and obtaining hard copies.
* Note: The *JOIS-III Guide* in English is a truncated version of the Japanese documentation. The latter can be obtained from NTIS.

Figure 1

Conducting Polymers/Polymer Batteries
General Strategy: Japanese

導電性高分子 ★
伝導性高分子
導電性ポリマ
導電性ポリマ&
伝導性ポリマ
伝導性ポリマ&
導電性プラスチック
導電性プラスチック&
伝導性プラスチック
伝導性プラスチック&
高分子伝導体
有機伝導体 ★
高分子半導体 ★
有機半導体 ★

高分子電池
高分子&電池
高分子バッテリー
高分子&バッテリー
ポリマ電池
ポリマ&電池
ポリマバッテリー
ポリマ&バッテリー
プラスチック電池
プラスチック&電池
プラスチックバッテリー
プラスチック&バッテリー
ペーパ電池
ペーパ&電池
ペーパバッテリー
ペーパ&バッテリー
有機電池
有機&電池
有機バッテリー
有機&バッテリー

34 terms

Figure 2

Conducting Polymers/Polymer Batteries
General Strategy: English

ELECTROCONDUCTIVE POLYMER ★
ELECTROCONDUCTIVE[W]POLYMER&
CONDUCT&[W]POLYMER&
CONDUCT&[W]PLASTIC&
POLYMER&[W]CONDUCTOR&
ORGANIC CONDUCTOR ★
ORGANIC[W]CONDUCTOR&
POLYMERIC]SEMICONDUCTOR ★
POLYMER&[W]SEMICONDUCTOR&
ORGANIC SEMICONDUCTOR ★
ORGANIC[W]SEMICONDUCTOR&

POLYMER[W]BATTER&
POLYMER&[W]BATTER&
POLYMER&[1W]BATTER&

PLASTIC[W]BATTER&
PLASTIC[1W]BATTER&

PAPER[W]BATTER&
PAPER[1W]BATTER&

ORGANIC[W]BATTER&
ORGANIC[1W]BATTER&

20 terms

Figure 3

		JICST FILE 010	JQUICK FILE 030	NK-MEDIA FILE 070
導電性高分子 ★		2147	175	112
伝導性高分子		15	9	0
導電性ポリマ		44	0	0
導電性ポリマ&		75	37	2
伝導性ポリマ		2	0	0
伝導性ポリマ&		5	0	0
導電性プラスチック		94	7	1
導電性プラスチック&		104	10	1
伝導性プラスチック		1	0	0
伝導性プラスチック&		1	0	0
高分子伝導体		0	0	0
有機伝導体 ★		647	25	0
高分子半導体 ★		88	2	0
有機半導体 ★		428	24	27
SUBTOTAL A	[LN=JA, 79%]	2756	277	139
高分子電池		8	0	0
高分子&電池		18	1	0
高分子バッテリー		5	0	0
高分子&バッテリー		5	0	0
ポリマ電池		12	0	0
ポリマ&電池		24	6	4
ポリマバッテリー		4	0	0
ポリマ&バッテリー		6	3	1
プラスチック電池		19	1	0
プラスチック&電池		20	1	0
プラスチックバッテリー		0	0	0
プラスチック&バッテリー		0	0	0
ペーパ電池		2	0	0
ペーパ&電池		13	2	1
ペーパバッテリー		0	0	0
ペーパ&バッテリー		1	1	0
有機電池		4	0	0
有機&電池		40	14	0
有機バッテリー		0	0	0
有機&バッテリー		0	0	0
SUBTOTAL B	[LN=JA, 94%]	118	28	6
TOTAL (A+B)		2815	304	146
LN=JA		2233	302	146
%LN=JA		79%	99%	100%

Figure 4

	JICST FILE 010	JQUICK FILE 030	JICST-E FILE 510	JICST-E STN
ELECTROCONDUCTIVE POLYMER ★	0	0	1786	1775
ELECTROCONDUCTIVE[W]POLYMER&	46	5	96	1775
CONDUCT&[W]POLYMER&	252	242	333	331
CONDUCT&[W]PLASTIC&	20	10	35	35
POLYMER&[W]CONDUCTOR&	4	0	5	5
ORGANIC CONDUCTOR ★	0	0	530	536
ORGANIC[W]CONDUCTOR&	42	34	64	547
POLYMERIC SEMICONDUCTOR ★	0	0	78	75
POLYMER&[W]SEMICONDUCTOR&	0	1	0	75
ORGANIC SEMICONDUCTOR ★	0	0	309	310
ORGANIC[W]SEMICONDUCTOR&	21	11	37	313
SUBTOTAL A	385	302	2341	2322
POLYMER[W]BATTER&	13	5	25	25
POLYMER&[W]BATTER&	13	5	25	25
POLYMER&[1W]BATTER&	16	5	31	31
PLASTIC[W]BATTER&	3	2	9	9
PLASTIC[1W]BATTER&	3	2	10	10
PAPER[W]BATTER&	0	1	4	3
PAPER[1W]BATTER&	1	1	8	7
ORGANIC[W]BATTER&	0	0	2	2
ORGANIC[1W]BATTER&	1	0	4	4
SUBTOTAL B	19	8	51	50
TOTAL (A+B)	402	309	2364	2345
LN=JA	316	256	1828	1810
% LN=JA	79%	83%	77%	77%

Figure 5

	JICST FILE 010	JQUICK FILE 030	NK-MEDIA FILE 070
TOTAL (A+B)	2815	304	146
LN=JA	2233	302	146
%LN=JA	79%	99%	100%
TOTAL NUMBER OF RECORDS	6,282,674*	2,844,663*	255,324
RECORDS BEGIN	1981	1990	1983
DATE SEARCH WAS CONDUCTED	2/21/93	2/22/93	2/22/93
DATE OF FILE UPDATE	2/13/93	2/11/93	2/18/93
ENGLISH TITLES	144/210	58/110	0%
ENGLISH ABSTRACTS	0%	14/110	0%
ENGLISH KEYWORDS	0%	0%	0%
JAPANESE ABSTRACTS	100%	37/110	100%
JAPANESE KEYWORDS	100%	0%	100%

Figure 6

	JICST FILE 010	JQUICK FILE 030	JICST-E FILE 510	JICST-E STN
TOTAL (A+B)	402	309	2364	2345
LN=JA	316	256	1828	1810
% LN=JA	79%	83%	77%	77%
TOTAL NUMBER OF RECORDS	6,282,674*	2,844,663*	1,589,666	--
RECORDS BEGIN	1981	1990	1985	1985
DATE SEARCH WAS CONDUCTED	2/21/93	2/22/93	2/22/93	2/23/93
DATE OF FILE UPDATE	2/13/93	2/11/93	2/17/93	2/14/93
ENGLISH TITLES	21/21	85/85	100%	100%
ENGLISH ABSTRACTS	0%	30/85	97/194	--
ENGLISH KEYWORDS	0%	0%	100%	100%
JAPANESE ABSTRACTS	100%	5/85	0%	0%
JAPANESE KEYWORDS	100%	0%	0%	0%

Figure 7

	JICST FILE 010	JQUICK FILE 030	NK-MEDIA FILE 070
PD=1992	210	110	11
LN=JA	184	110	11
% LN=JA	88%	100%	100%
PD=1991	348	94	17
LN=JA	286	93	17
% LN=JA	82%	99%	100%
PD=1990	373	77	15
LN=JA	294	76	15
% LN=JA	79%	99%	100%
PD=1989	299	22	13
LN=JA	240	22	13
% LN=JA	80%	100%	100%
PD=1988	304	0	11
LN=JA	229	0	11
% LN=JA	75%	--	100%
PD=1987	289	1	21
LN=JA	207	1	21
% LN=JA	72%	100%	100%
PD=1986	284	--	11
LN=JA	206	--	11
% LN=JA	73%	--	100%
PD=1985	232	--	23
LN=JA	187	--	23
% LN=JA	81%	--	100%
PD=1985-date	2339	--	122
LN=JA	1833	--	122
%LN=JA	78%	--	100%

Figure 8

	JICST FILE 010	JQUICK FILE 030	JICST-E FILE 510	JICST-E STN
PD=1992	21	85	194	178
LN=JA	20	77	168	153
% LN=JA	95%	91%	87%	86%
PD=1991	48	103	357	354
LN=JA	38	83	294	291
% LN=JA	79%	81%	82%	82%
PD=1990	55	91	372	372
LN=JA	44	72	293	293
% LN=JA	80%	79%	79%	79%
PD=1989	35	30	294	294
LN=JA	27	24	235	235
% LN=JA	77%	80%	80%	80%
PD=1988	61	0	298	298
LN=JA	54	0	222	222
% LN=JA	89%	--	74%	74%
PD=1987	57	0	284	284
LN=JA	45	0	200	200
% LN=JA	79%	--	70%	70%
PD=1986	51	--	272	272
LN=JA	41	--	190	190
% LN=JA	80%	--	70%	70%
PD=1985	56	--	230	230
LN=JA	42	--	181	181
% LN=JA	75%	--	79%	79%
PD=1985-date	384	--	2301	2282
LN=JA	311	--	1783	1765
% LN=JA	81%	--	77&	77%

Figure 9

CONDUCTING POLYMERS/POLYMER BATTERIES
JAPANESE - ENGLISH INTERSECTION
JICST; FILE 010
NA=JPN

Year	JICST FILE 010 Search in Japanese	JICST FILE 010 Search in English	Japanese search only	Japanese and English	English search only
1992	210	21	191	19	2

Coverage by searching in English = 19/210 = 9%

CONDUCTING POLYMERS/POLYMER BATTERIES
JAPANESE - ENGLISH INTERSECTION
JICST; FILE 010 vs. JICST-E; FILE 510
NA=JPN

Year	JICST FILE 010 Search in Japanese	JICST-E FILE 510 Search in English	Japanese search only	Japanese and English	English search only
1992	210	194	24	186	8

Coverage by searching in English = 186/210 = 89%

CONDUCTING POLYMERS/POLYMER BATTERIES
JAPANESE - ENGLISH INTERSECTION
JICST; FILE 010 vs. JICST-E; STN
NA=JPN

Year	JICST FILE 010 Search in Japanese	JICST-E STN Search in English	Japanese search only	Japanese and English	English search only
1992	210	178	37	173	5

Coverage by searching in English = 178/210 = 82%

Figure 10

CONDUCTING POLYMERS/POLYMER BATTERIES
JAPANESE - ENGLISH INTERSECTION
JICST; FILE 010
LN=JA

Year	JICST FILE 010 Search in Japanese	JICST FILE 010 Search in English	Japanese search only	Japanese and English	English search only
1992	184	20	165	19	1

Coverage by searching in English = 19/184 = 10%

CONDUCTING POLYMERS/POLYMER BATTERIES
JAPANESE - ENGLISH INTERSECTION
JICST; FILE 010 vs. JICST-E; FILE 510
LN=JA

Year	JICST FILE 010 Search in Japanese	JICST-E FILE 510 Search in English	Japanese search only	Japanese and English	English search only
1992	184	168	22	162	6

Coverage by searching in English = 162/184 = 88%

CONDUCTING POLYMERS/POLYMER BATTERIES
JAPANESE - ENGLISH INTERSECTION
JICST; FILE 010 vs. JICST-E; STN
LN=JA

Year	JICST FILE 010 Search in Japanese	JICST-E STN Search in English	Japanese search only	Japanese and English	English search only
1992	184	153	34	150	3

Coverage by searching in English = 150/184 = 82%

NSF-NACSIS Japanese Science & Engineering Database Access Project

Mr. Lawrence Garfield, NSF-NACSIS Database Search Operator

Since 1989, the National Science Foundation (NSF) and the National Center for Science Information Systems (NACSIS) have been offering a free science and engineering database service to U.S. researchers in government, industry, and academia. NSF is offering access to fifteen Japanese databases provided by NACSIS.* Most of these are unique sources of information elsewhere unavailable. NSF will also translate upon request any Japanese-language information retrieved from the databases.

NACSIS is an agency under the Japanese Ministry of Education, Science and Culture (Monbusho). Its predecessor, the Center for Bibliographic Information at the University of Tokyo, was established in 1976 to improve the distribution system for scientific information. Their main activity was the development of Union Catalogs of university library holdings. In 1986, NACSIS was established as an Inter-University Research Institute replacing the Center for Bibliographic Information. In 1987, NACSIS commenced operation of the Science Information Network, making the Union Catalogs and other databases available online to the Japanese academic community. In 1989, the Network was connected to NSF and a trial service was offered to the US research community; a similar project was also established in England via the British Library.

The NACSIS databases are mounted on computers in Japan and are searchable using IBM 5551 Japanese DOS machines installed at NSF and at the Library of Congress (LC). These terminals are connected to the Mt. Fuji Gateway, which consists mainly of a Sun 3/260 workstation at NSF and a NETRIX 1-ISS DTM at NASA Ames Research Center in California. Through NSF, the Gateway also enjoys access to the Internet, enabling communications by electronic mail between NACSIS and the international research community. Researchers are wel-

* **Note: This service was temporarily discontinued in May 1993 due to funding cuts.**

come to use the IBM terminals at either NSF or LC (The hours of availability are 9 a.m. to 12 noon at NSF; 7 a.m. to 12 noon and 7 p.m. to 9 p.m. at LC). Most researchers, however, ask the NSF and LC staff perform the searches since they are unable to come to Washington or are unfamiliar with the Japanese language.

Search results are delivered by U.S. mail, facsimile, or, at NSF, by electronic mail. Requestors can obtain Japanese-language outputs from an NSF host computer in binary mode by a procedure known as "anonymous ftp." The character code used is the 7-bit New-JIS code, which includes standard ASCII characters as well as 1-byte *katakana* and 2-byte *kana* and *kanji* codes. Additionally, data may be delivered on 5" DSDD floppy disks formatted with IBM Japanese DOS 3.20 and using the 8-bit Shift-JIS code.

Available Databases

The fifteen databases available for searching from the US are as follows:

- **KAKEN** (Grant-In-Aid Research Reports) - Annual reports of academic research sponsored by Monbusho. All disciplines are covered, although science, technology, and medicine make up the bulk of the database. Approximately one quarter of the records include English translation and lengthy abstracts, which are retrievable by a record type code.

- **GAKKAI** (Academic Conference Papers) - Bibliographic citations and abstracts of papers presented at conferences of various professional societies. Extensive coverage in the areas of architecture and civil engineering, agrochemistry and biotechnology, ceramics, electronics, information and control systems, and polymers. Almost all records include English titles, author names, and key words, and one quarter of them include English abstracts, which can be obtained by searching the text (abstract) field for common English words such as "is," "this," "which," "that," "we," and "have".

- **GAKUI** (Dissertation Index) - Bibliographic citations to doctoral dissertations submitted to Japanese universities. All disciplines are covered. Many titles and author names are also provided in English and Romanized spelling.

- ***CAT** (Union Catalogs of Japanese and Foreign Books and Serials) - Four databases, being JBCAT, FBCAT, JSCAT, and FSCAT, which cover Japanese university and academic research library collections. Complete bibliographic and library holdings information is provided. The foreign catalogs cover publications in all languages, providing a unique source of information for those interested in other nations in addition to Japan.

- **RES** (Researchers' Directory) - Information about researchers at Japanese universities and academic research centers, based on a survey conducted by Monbusho in 1989. Includes biographical information, institutional affiliations, research interests, and up to three citations to representative publications. Available in Japanese and English.

- **KEIZAI** (Economic Papers Index) - Citations to papers on economics and commerce published in a wide variety of academic, professional, and official publications. Includes some English.

- **DBDR** (Database Directory) - Detailed descriptions of databases produced at Japanese universities and academic research centers. Includes names and telephone numbers of contact persons for those wishing to request more information about the databases or permission to access them. All records are in Japanese, though many of the databases covered contain English.

- **JOSEI** (Private Grants-In-Aid Research Reports) - Comparable to KAKEN. Contains research sponsored by the Mitsubishi Foundation, the Toray Society for the Promotion of Science, the Foundation for Promotion of Electrical Communication, and the Broadcasting and Culture Fund. Most records include English abstracts, which are retrievable by record type code.

- **RAMBIOS** (Index of Review Articles in Molecular Biology) - Citations to review articles in molecular biology published in Japanese and international journals. Available in English.

- **KASEI** (Index of Literature in Home Economics) - Citations to journal articles in home economics. Available in Japanese only.

- **ISHIN** (Database of Materials on the Meiji Restoration) - Citations to historical events during the Meiji Restoration (1846-1871). Available in Japanese only.

- MOKKAN (Wooden Tablets) - Data on wood inscriptions unearthed by archaeologists in Japan. Available in Japanese only.

Hot Topics Updates

In addition to performing searches of the above databases as requested by members of the research community, NSF also provides a free Hot Topics update service. Each Hot Topics package, which is updated approximately three times a year, contains up to 100 of the most recent records added to the GAKKAI Conference Proceedings databases. All of the information is provided in English. Abstracts are not provided where English is not available. The Japanese names of source publications are also provided to facilitate acquisition. Currently, the following 16 topics are offered:

AI/Expert Systems

Neural Networks

Applied Biotechnology

NLP/Machine Translation

Biomedical Engineering

Optoelectronics

CAD/CAM-CIM

Parallel Computing

Ceramics

Polymers

Database Technology

Robotics

Electronic Displays

Sensors and Sensing

Integrated Circuits

Telecommunications

In addition to these topics, NSF is now offering requestors the opportunity to define Custom Hot Topics in their particular areas of interest. Results are likely to be best when the subjects requested are compatible with the coverage of the GAKKAI database. Custom topics requested so far include "Fractal Geometry," "Fuel Cells/Batteries," "High-Definition Television," "Information Retrieval Systems," and "Virtual Reality."

NACSIS Usage

Usage of the NSF-NACSIS service has varied over the past three years (as shown in Appendices A and B). Requests are distinguished between "regular" and "Hot Topics" requests. A total of 1,000 regular requests have been received from 743 requestors. Of these requestors, 51 percent were from academia, 34 percent from industry, 10 percent from government, and 5 percent unspecified. A total of 1,074 Hot Topics packages were mailed to 302 requestors. In contrast with regular requestors, 44 percent of the Hot Topics requestors were from industry, 36 percent from academia, 15 percent from government, and 5 percent unspecified. Two updates have been distributed so far. If and when the third update is distributed, there will be at least 679 Hot Topics and Custom Hot Topics packages to be mailed to at least 193 recipients. Of the original Hot Topics, demand was highest for "AI/Expert Systems" and "Neural Networks," though all sixteen topics enjoy significant demand.

The available NACSIS databases have been searched to various extent according to the needs of the requestors. Originally, the KAKEN database was the most frequently searched because its subject coverage was fairly extensive and provided lengthy English abstracts. However, as these abstracts pertain to annual reports of academic research and are over a year old, a tendency developed toward greater use of the GAKKAI databases (merged into one database as of December 1992). These contain abstracts of conference papers with information as current as several months and provided the contents of the Hot Topics update service. The GAKKAI databases have a particularly strong

coverage of computers, electronics, materials, architecture and civil engineering. The RES Researchers' Directory was also used because of its broad subject coverage, and was particularly useful to requestors interested in contacting Japanese researchers. The other databases were used less frequently or not at all, generally for those requestors interested in specific literature types (such as dissertations, books, serials, and academic databases) or specific subject areas (including economics, home economics, Japanese history, and Japanese archaeology).

Frequent promotional activity seemed necessary to stimulate use. Originally, a program announcement was distributed to approximately 8,000 heads of departments at universities around the country. Since the response was very light, NSF issued four press releases announcing the service and new features.

The first release, dated June 19, 1990, was a general description of the NACSIS service. This and subsequent releases were distributed through normal NSF channels. Additionally, this release was uploaded to several electronic bulletin boards and distributed to a number of professional societies for announcement in their journals and trade publications. As a result, the number of requestors per month more than doubled, and this trend lasted for several months, with a notable increase in the number of requests from the industrial sector.

The next announcement, published in *NSF Tipsheet*, March 26, 1991, reported on the new Conference Proceedings and Researchers' Directory databases. Due to an error in the contact information, there was little response to this release. However, there was a brief surge in requestors from academia, most of whom were participants in NSF's "Summer Institute in Japan" program; they were interested in the Researchers' Directory as a source of information about the researchers with whom they would be working that summer.

The third release, dated October 24, 1991, announced the new Hot Topics service. As can be seen by the usage figures, the Hot Topics service met with abundant interest. This response was presumably due to the distribution of the press release in professional and trade publications. It is noteworthy that the requestors for Hot Topics essentially do not overlap with the regular requestors, indicating that the Hot Topics service reached an otherwise untapped market.

The last release, issued July 23, 1992, announced the availability of the *Custom* Hot Topics service. Following this, there was a slight increase in both regular and Hot Topics requests. Promotion within NSF and at various conferences on Japanese information has also resulted in additional usage.

Evaluations

An evaluation form was included with the mailing of all search results (except when no records were retrieved). A tabulation of the 225 responses received through the end of the first option year (February 1992) was performed, and the following statistical information was obtained. Concerning the source from which the requestors learned of the NACSIS service, 40 percent indicated a publication; 24 percent, NSF; 19 percent, a colleague; and 17 percent, other. Concerning satisfaction with the performance of the NSF-mediated service, 67 percent indicated that the results were moderately to completely satisfactory and 42 percent considered at least 50 percent of the records received to be fully relevant, while 67 percent considered at least 50 percent to be somewhat to fully relevant (average 15-25 records per database searched); 38 percent considered the number of records received as "just right," while 47 percent would have liked more; 84 percent found the speed of response adequate (average turnaround time was 1-2 days for delivery by e-mail, 2-7 by regular mail).

Some respondents also provided comments, generally indicating the types of enhancements they would like for the service. These included document delivery and translations (referred to NTIS and the American Translators Association), direct enduser access online (reported to NACSIS), electronic delivery of search results (implemented March 1991), prior knowledge of the NACSIS databases and their contents (addressed by current database factsheet and Hot Topics updates), and more English abstracts (specific abstracts translated if requested).

Between May and June 1991, a telephone survey of a random sample of past requestors was also conducted. To avoid any bias toward individuals who had strong opinions, these included both persons who had and those who had not responded to the above-cited evaluation form. The results of the survey were in basic agreement with the data

obtained from the evaluation forms. It was revealed that 57 percent of the respondents felt that the search results were complete and 60 percent approved of their relevancy. Also, about 70 percent of those polled planned to request more searches. Concerning the value of the service, a willingness to pay for the service was expressed by 55 percent of those interviewed, two-thirds of whom would pay $25 or more. Finally, the interviewees were asked whether they would be interested in the availability of pre-packaged information and what topics they would like to see covered. The responses showed a strong inclination toward computers, semiconductors, and superconductors. This information became part of the input into deciding what topics to be included in the Hot Topics updates.

Conclusions

Usage of the NACSIS service through NSF has been sporadic and somewhat lower than anticipated, given the public perception that Japanese information is in high demand yet not readily available. It has been concluded that publicity, particularly in the form of NSF press releases, results in increased usage for limited periods. Also, the Hot Topics service has opened up a new and successful market for NACSIS. Finally, evaluations received from requestors demonstrate that the service is perceived as valuable and its performance satisfactory.

APPENDIX A: SUMMARY OF NACSIS USAGE

1. Regular Requestors/Requests

   Academic Requestors: 378 (51%)

   Corporate Requestors: 253 (34%)

   Government Requestors: 75 (10%)

   Other Requestors: 37 (5%)

   Total: 743 (100%)

   Total Number of Requests: 1000 (1.6 requests/requestor)

2. Hot Topics New Requestors/Packages Requested

   Corporate Requestors: 132 (44%)

   Academic Requestors: 110 (36%)

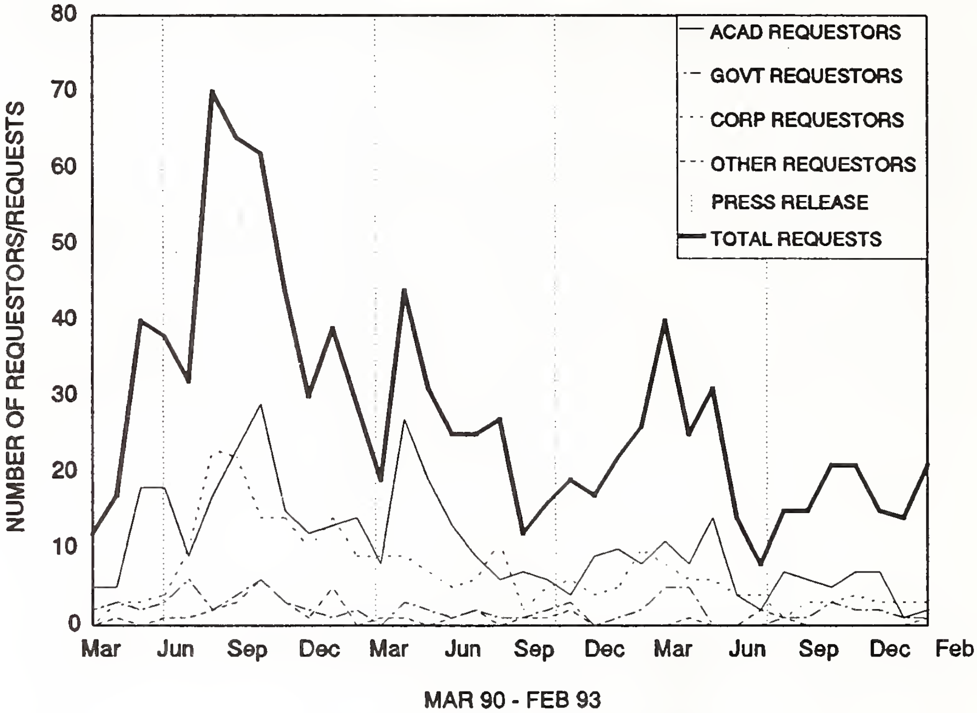
   Government Requestors: 45 (15%)

   Other Requestors: 15 (5%)

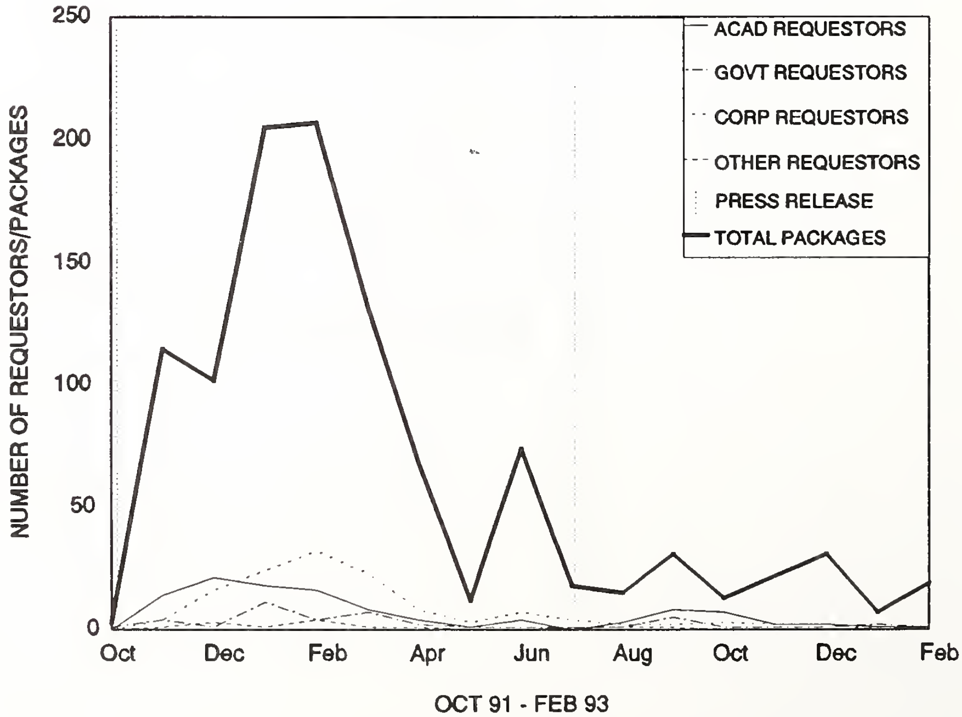
   Total: 302 (100%)

   Total Number of Packages Requested: 1074 (3.6 packages/requestor)

APPENDIX B: GRAPHS OF NACSIS USAGE



Regular Requestors/Requests



Hot Topics Requestors/Packages

Machine Translation -- A Report by the Japanese Information Sciences Project at New York University

Dr. Susan Goldman, Research Scientist, Courant Institute of Mathematical Sciences, New York University

The Japanese Information Sciences Project at the Courant Institute of Mathematical Sciences, New York University was established in November 1982, based on the recommendation of the Computer Science and Technology Board of the National Research Council that "academic centers of expertise on Japanese computing be established in the U.S."

Now entering its second decade, the Project has been recognized internationally for its unique approach to combining three major components -- information acquisition, translation and education. It has been the Project's goal to serve as the model for the implementation of procedures to facilitate the transfer of information from Japan, whether by providing access, through translations, to both published materials and "grey" literature that would otherwise be virtually unknown and unavailable in the United States, or through direct contacts with the Japanese scientific and technical community. All staff members have Japanese fluency.

The Project acquires, translates, and analyzes Japanese technical materials of greatest interest to the U.S. government and scientific communities, focusing on computer science, materials science, and science policy. To acquire these materials, the Project takes full advantage of its wide network of personal contacts in Japan, Europe, and the United States.

Issues Concerning the Acquisition and Translation of Japanese Scientific and Technical Information

Although the 1984 edition of the *Directory of Japanese Scientific Periodicals*, published by the National Diet Library in Tokyo, lists more than 9,000 science and technical journals, most American scientists are

largely unaware of the work done by their Japanese counterparts. In large measure, however, this is due to the language barrier. Even in cases where the information is written in English, there remain serious difficulties in learning about and/or obtaining scientific literature from Japan. At even the most prestigious Americans universities, one often hears scientists state that no work of value is being done in Japan because they "have not seen anything from Japan [in English]."

At the time of its establishment, it was decided that, in order to provide the most timely and valuable information, the Japanese Information Sciences Project would be extremely selective in its translation activities. Despite a staff consisting entirely of scientists with Japanese fluency, it immediately became apparent that the problem of Japanese technical translation overall required serious thought and discussion, given the unevenness of quality in the materials being examined.

The Japanese Information Sciences Project has become a model for projects of its type. The Project was launched at the "right" time. We started slowly and never took on work that we were unable to handle. Our staff was entirely computer literate, and was chosen so as to balance science/engineering and language. We had extensive personal experience with Japanese language and translation before examining machine translation systems. We did not try to duplicate the work of large-scale projects or of corporations. We were positive but never unrealistic about what machine translation could accomplish. We took full advantage of university resources, most particularly those of our Institute, which has always totally supported the Project. Our location in New York City, with access to Japanese corporations, bookstores and many university library systems was a definite advantage. We were able to move with speed and flexibility.

It was obvious that the United States would never have a sufficient number of Japanese technical translators to even begin to cope with the volume of published and grey literature, and that, just as in the 1920s, Ph.D.s in mathematics universally learned to read German, the 1990s would have to produce scientists who could read their own literature in Japanese.

Consequently, within four months of its inception, the Project began to design a three-year Japanese language sequence in which the second half was technical Japanese. With the strong backing of the Depart-

ment of Computer Science, the sequence was adopted by the university senate in April 1983, and the Project director took on additional teaching responsibilities in order to be able to evaluate the curriculum that had been designed for technical Japanese. The Japanese language program has expanded steadily over the years, and has been very successful at NYU, now enrolling more than 200 students.

However, even in the unlikely event that large numbers of scientists and engineers expended the very considerable effort necessary to reach the level of being able to read technical materials in Japanese, there still remained the need for large amounts of Japanese to English translation, a need that still would not be met. The process of translation from Japanese to English is complicated by extreme differences in language structure, writing system, technical style and culture. Moreover, there are problems specific to technical Japanese, which means that the student of a standard Japanese language curriculum will have spent considerable time on certain aspects that are absolutely necessary for competence in Japanese *per se*, but are largely irrelevant if the aim is the comprehension of scientific text.

At the same time, the student will have received inadequate exposure to the forms that are specific to scientific writing. The quality of this writing, moreover, varies very widely, as Japanese are tracked for science and therefore, do not study Japanese composition at universities in Japan. Appendices 1 and 2 outline the difficulties in translating technical Japanese.

Issues Concerning Machine Translation

The Project had to respond quickly to the need for accurate and well-written translations. We moved naturally toward the promotion of any tools that would automate the translation process. This process is often seen from the idealistic notion of a machine that automatically produces excellent quality text in the target language (in this case, English) when provided with the source text (Japanese), again in some automated manner that eliminates human intervention. Dreams in 1964, expressed by the Alvey Project, of such totally automated translation remain unrealized, and we feel that the "mechanization" of translation is, in fact, actually a continuum that begins with the typewriter replacing creation manuscripts by hand and ends with fully

automated machine translation (MT) systems that receive their input by optical character readers or from files sent via e-mail from anywhere in the world.

Obviously, just as the word processor was more efficient than the typewriter, machine-assisted text processing or translation is desirable at any level to the extent that it eliminates aspects of the translation process that are repetitive and/or extremely time-consuming. Machine translation does not preclude the need however for highly-trained specialists in technical Japanese. Again, even the term "machine translation" while used very loosely to mean full automation, would be better seen as either human translation assisted by machines, or machine translation assisted by humans.

As the above discussion has indicated, the Project was a prime candidate for work with the fledgling machine translation systems that were being developed throughout the 1980s. Being university-based, we could examine commercial systems impartially. With a tight-knit staff of scientists and engineers, we would be able to verify the accuracy of the translation, and with Japanese fluency, we would have the knowledge to examine the source texts against the output. By this time, too, we had fairly extensive experience with Japanese-language issues, and the Project director was a trained linguist, who had spent a decade in Japan. Our small size would allow close collaboration and thus full discussion among all members.

As early as 1984, we began discussion with the small Japanese MT firm, Bravice. In 1986, the Project was chosen as the first U.S. test-site for the Bravice PC-based Japanese-to- English machine translation system. Since 1986, the Project has performed extensive investigations of commercially-available Japanese-English/English-Japanese Machine Translation systems and other tools for translation, such as optical character readers and scanners. In addition, the Project has created J-E / E-J machine-readable dictionaries in specific technical fields. Translation quality should be evaluated for intelligibility as well as accuracy. These two parameters have been coded according to the criteria as reported by Professor Nagao Makoto, the head of MU, the first major J-E machine translation project in Japan. See Appendices 3 and 4 for a more complete discussion of these parameters.

It should be noted that intelligibility refers to "intelligibility in English" with no reference to the Japanese source, or knowledge of the language. A person fluent in Japanese reading a text translated into English will ordinarily be able to "comprehend" texts that do not make sense by extrapolating from Japanese syntactic structure. While accuracy is perhaps the more important of the two, intelligibility and accuracy generally correlate directly, and one rarely finds a very accurate translation that is unintelligible.

In the next section, the results of the Project's experiences with these two systems will be presented through examples and their significance discussed. These samples are not given intelligibility or accuracy ratings as above, as this was not our purpose; rather, we were interested in the types of problems that would arise, in order to make recommendations as to what development aspects might need improvement.

The Bravice system runs according to the following model, but for the trials outlined, there was no pre-editing or post-editing, as again the goal was the see how the system would handle Japanese as given. Ordinarily, Bravice results do improve with a simple level of pre-editing. It would not have been a fair comparison to change the original in any way, as there was no pre-editing with the mainframe system. The model (see Appendix 5) is presented to provide a visualization of the hierarchy of one MT system.

In 1991, the Project was invited to serve as the sole university test-site for a mainframe-based Japanese-to-English machine translation system. The system, was not publicly available in the United States, and we were very interested in comparing our previous results with what a mainframe system might produce. Unfortunately, for the purposes of the testing, the manufacturer limited the source texts to a database of articles from the *Nikkan Kogyo Shimbun* (the Industrial Daily News). This meant that rather than using materials for which we had already obtained translations, we had to take these articles and move them to the Bravice system, where they were duly translated.

This then allowed us to perform the first comparative MT trials of these two systems in the United States. As Bravice is a PC-based system, we were able to determine the cost effectiveness of a system one-tenth the cost of the mainframe system. The Project's findings, reported to the company, were extremely well-received, and were so influential that the

date at which the system was to become commercially available was initially postponed. It has just been reported to us that the company is refraining from further development of the system.

Actual Machine Translation Results

Actual results were obtained as follows: articles of interest were chosen and a request for translation submitted to Tokyo where the mainframe system resided. The English results came back line-by-line almost immediately. In the samples we provide below, these translated texts are called "1e." Where the results were relatively intelligible *per se,* they were accepted and the same Japanese article was submitted for Bravice translation, the results of which are labeled "be." Where the results of "1e" were unusual, in that the English chosen seemed "illogical," in other words, that we could not induce the rules that governed the system, we resubmitted the English text to Tokyo for a second pass through the system. We were not told exactly what the request for an "improved" translation might involve, whether the Japanese original would be pre-edited or the English post-edited. Thus, we are unable to state the degree of human intervention that ensued, as we had neither input into nor control over any aspect of this phase. This stood in contrast to our work with the Bravice system, which is physically located in our offices and which only we operate. The English results of the second transmission from Tokyo are labeled "2e." During the process of submitting texts to Tokyo and to Bravice a staff member manually translated the original texts and these results are indicated by "*pe*."

The following are several examples taken from the many texts obtained as a result of the Bravice/mainframe comparison trials. The samples are chosen for the types of problems they illustrate. The Project staff strongly predicted that the mainframe MT results would be far superior to the Bravice results, and thus size and / or cost would truly correlate with performance. *We were very much mistaken.* The mainframe translations were either worse than or no better than the Bravice translations, although they were often markedly different. The Bravice results tended to be at least as, if not more, intelligible than the mainframe results, in that they tended to follow more simplistically the Japanese word order, making it easier to the reader to guess what the Japanese text intended.

The Guess of Charge of Use

[j] 利用料金は，翻訳結果一文字当たり一円，Ａ４用紙一枚で八百円見当.

[1e] The guess of the charge of use. 800-yen 1 yen and A4 paper piece a translation result characters

[be] An application charge be to every 1 letter as a result of translation. It is 800 yen guess with whole, A4 form one.

[pe] The estimated charges for use are as follows: one yen per translated word/character, [Translator's note: Text is ambiguous — depends on whether translation results are English or Japanese] or in other words, 800 yen per A4 page.

A Large-Scale Unique Project

[j] 純国産のオリジナルな技術で推進している大規模で ユニークなプロジェクトだ.

[1e] It is a large scale, unique project promoted by the technology with an original pure domestic production.

[be] It is large-scale be promoting with original technology of pure domestic production. It is a unique project.

[pe] It is a large scale, unique project, promoted solely by Japanese technology.

The Point Laboratory

[j] 標題：東大先端研教授軽部征夫氏，インタビュー
「バイオセンサーはより人に近づく」

[1e] TITLE: The point laboratory The University of Tokyo professor Karube conquest husband — interview "Biosensor approaches the person."

[2e] TITLE: Kachio point laboratory The University of Tokyo professor Karube is interview "The biosensor approaches the person."

[pe] TITLE: Professor Karube Masao of the Advanced Science and Technology Center, at the University of Tokyo stated in an interview that rapid progress is being made on developing personal biological sensors.

In example 1, "1e" has failed to recognize that Japanese newspaper writing often abbreviates the verb, and in this case, the last word in "*je*," that is, "*kentou*" or "estimate" is actually a verb. The result might be understood if the clause "one yen per translated word / character" were posited correctly. As it stands now, the two clauses are intermingled. Since there is clear punctuation, it is difficult to understand what sort of machine rule would dictate this.

The Bravice system has handled the text very differently, and the results are partly easier to understand, and partly more difficult. It has joined the first two clauses, and translated what would ordinarily be "word" or "character" into "letter." This is actually a reasonable choice, not however given the real world facts surrounding the translation business, where price is not customarily based per letter. This is something that any human translator would be more than likely to know. The translator would know the target language, and would be able to choose "word" or "character." The second "be" sentence is neither intelligible to non-Japanese speakers nor accurate.

Example 2 is considerably clearer, but there are certain pitfalls. The term "pure domestic production" gives the sense of something "manufactured" whereas, here "*kokusan*" can also mean something "native." The human translator would know that in Japanese, using the word "*kokusan*" equals "Japanese" for there are many words of this type that say "national" but culturally are used to mean "national here in Japan."

The "be" results are far less clear because the sentence is broken into two, which means that the word "project," which the entire sentence actually modifies, is lost in the first sentence. A very literal translation would put everything in front of the word "project," as the Japanese actually does, giving: "It is a large scale, unique, promoted solely by Japanese technology project," but since, with relative clauses, English can handle both front and back modification, a better way to express the same idea would, of course, be "It is a large scale, unique project, promoted solely by Japanese technology."

Example 3 shows the two mainframe passes We resubmitted "1e" because we were quite surprised that the machine recognized "professor" and "*Karube*" and failed to recognize the personal name "*Masao*" which is clearly flagged by the honorific character "shi" made even more

apparent by the comma that directly follows. While the characters for "*Masao*" do, in fact, signify "conquest" and part of the word "husband," it is not in the least an uncommon name. The second sentence "Biosensor approaches the person" is literal but fails badly in conveying the intended idea.

The results of the second submission to the mainframe system left us in further confusion. While "*Masao*" can become "*Kachio*," the results have worsened because at least "conquest husband" followed the surname, allowing a person slightly familiar with Japanese to hazard a guess that this is actually a personal name.

In both cases, for a system developed to handle technical Japanese, a word such as "*sentan*" or "advanced" should have been included in the dictionary.

Conclusions

Although we expected many errors with the PC-based Bravice system which ceased development some time ago, the results of the mainframe were both surprising and disappointing, given that the mainframe system was to have been marketed within months of the beta testing. We observed

> (1) Insufficient technical vocabulary -- Both systems lacked sufficient technical vocabulary for even newspaper articles, and therefore would be completely inadequate for technical papers, of the type this Project ordinarily handles. In addition to omissions, both Bravice and the mainframe system translated certain technical words incorrectly, in the former "information age" became "technetronic age."
>
> (2) Inadequate grammatical rules -- In both systems modification order showed changes that seemed almost arbitrary. In one case, "new tools of science" became "tools of new science." This can lead to very dangerous misunderstandings.

(3) Inadequate semantic rules -- One good example of this is the above example of "domestic" for "Japanese" as opposed to "national, (for any given nation)."

(4) Inadequate punctuation rules -- The rules governing Japanese punctuation are incomplete. The systems change commas into periods and break sentences incorrectly.

(5) Insufficient dictionaries -- The mainframe dictionary was so poor that the company's own name was translated character by character. This means that the system is ready neither for highly specialized nor for general use. Extensive dictionary development is still needed.

(6) Missing text -- While we have not presented any examples here, in the mainframe system, there were texts from which large portions of text were missing, with no error messages to warn the reader. This is particularly dangerous because the reader without Japanese would be unable to guess that there were omissions unless the overall translation stream did not flow smoothly.

The Japanese Information Sciences Project concludes, therefore, while extremely interesting to work with, in no way can automated systems be expected to do more than provide considerable help at best, little help or none at all at worst, to the Japanese technical translator. Much work is still needed, and a truly useful or practical system is still far from reach.

Appendix 1

Differences between Technical and Non-Technical Japanese

1) Disappearance of formal forms, and respect language

2) No literary ambiguity

3) Smaller range of grammatical constructions

4) Limited character and vocabulary sets

Appendix 2

Problems with Source Texts

Technical Japanese has sentence structures which are more complex, with

1) long nominal compounds,
2) noun-phrase conjunctions,
3) mathematical and physical formulas,
4) long embedded clauses, or sentences

Technical writing is not taught at any level of education

Appendix 3

Intelligibility

Intelligibility — The extent to which a translated text can be understood by a native speaker of the target language-- an average British or American reader without any reference to the Japanese original.

Intelligibility

1. The meaning of the sentence is clear and there are no questions. Grammar, word usage and style are all appropriate. No rewriting is necessary.

2. The meaning of the sentence is clear but there are questions concerning grammar, word usage and / or style.

3. The basic thrust of the sentence is clear but there are questions concerning detailed parts because of grammar and word usage problems which cannot be resolved. The Japanese original must be clarified.

4. The sentence contains many grammatical and word usage problems, and the meaning can only be guessed at, if understood at all. The Japanese sentence must be retranslated because too many revisions would be needed.

5. The sentence cannot be understood at all.

Appendix 4

Accuracy The degree to which the text coveys the meaning of the original and the measure of the amount of difference between source and output sentences -- by Japanese translators specializing in Japanese to English translation.

Accuracy

0. The content of the input sentence is faithfully conveyed in the output. The translated sentence is clear to a native speaker and no rewriting is needed.

1. The content of the input sentence is faithfully conveyed in the output and can be understood by a native speaker, but some rewriting is needed, without referring to the original. No Japanese language assistance is required.

2. The content of the input sentence is faithfully conveyed in the output, but some changes are needed in word order.

3. Although the content of the input sentence is faithfully conveyed in the output, but there are some problems with relationships between phrases and expression, and tense, voice, plurals and adverb position. Noun duplication occurs.

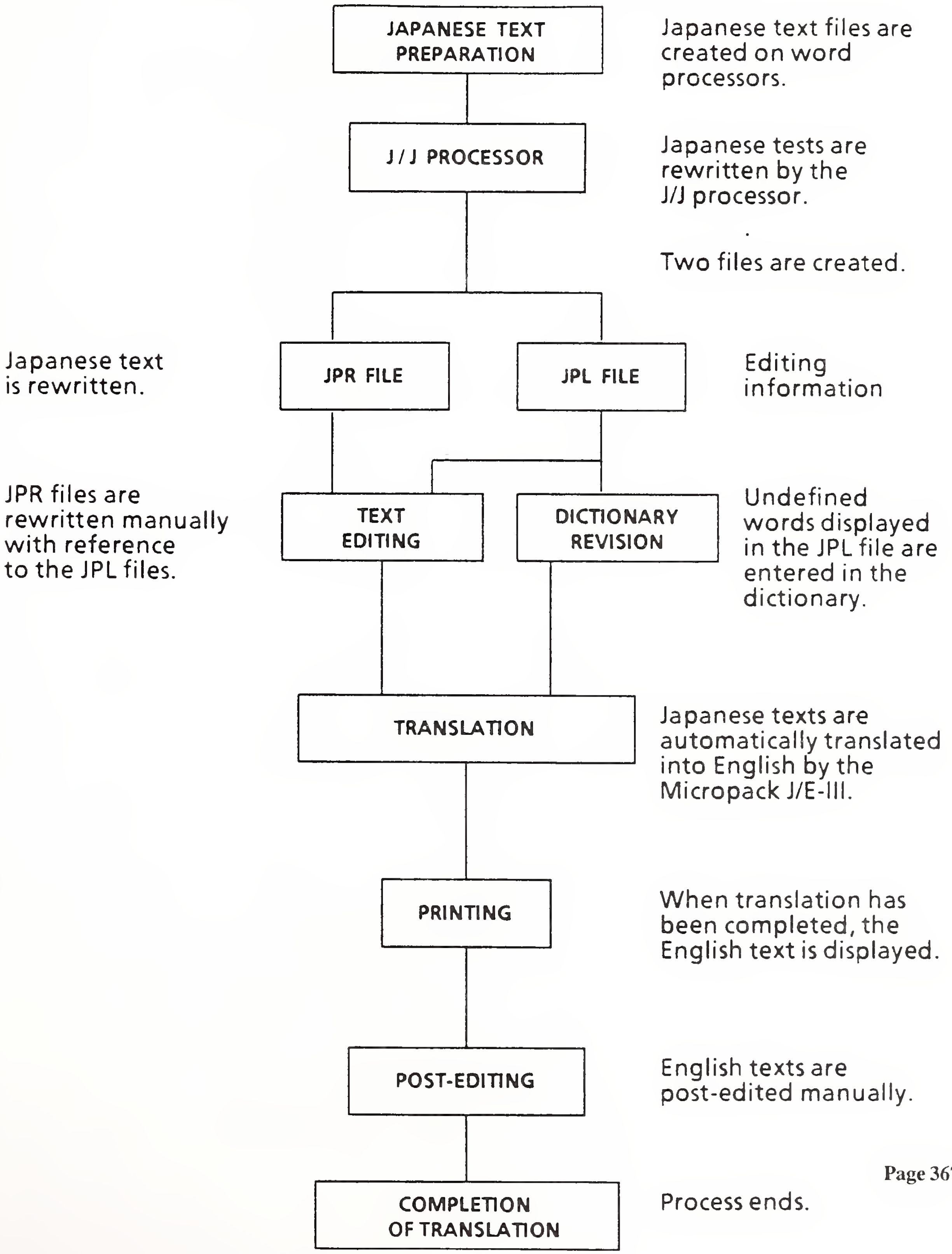
4. The content of the input sentence is not adequately conveyed in the output. Some expressions are missing, and there are problems with relationships between clauses, phrases and clauses, or between sentence elements.

5. The content of the input sentence is not conveyed in the output. Clauses and phrases are missing.

6. The content of the input sentence is not conveyed in the output at all. The output is not a proper sentence; subjects and predicates are missing. In noun phrases, the main noun is missing, or a clause or phrase acting as a verb and modifying noun is missing.

Appendix 5

Bravice Micropack J/E Automatic Translation System Flow Chart



Network of Japanese Translation Services

Mr. Robert W. Brown, Electronics Engineer, U.S. Army Communication-Electronics Command

In recent years the U.S. Army, as well as other military departments, has been establishing a policy of "internationalization" of research and development projects with our allies. As an example of such a project carried out with the government of Japan, we can cite the FSX co-development program. Many other joint programs are presently under-way, sponsored by the many government agencies and academia of the two countries.

Within the U.S. Army there are a number of different research and development laboratories, distributed geographically throughout the United States. The problem posed in terms of obtaining Japanese Scientific and Technical Information is as follows: having obtained what may appear to be useful information, how can one expeditiously, and economically, have it translated? Also, where should the translation function be located? The U.S. Army has approached this problem.

Having become aware of the advances in machine translation (MT) technology in recent years, particularly in Japanese developed systems, it was thought that having a MT unit at each laboratory could provide the desired service. The mode of use envisioned was as follows. Most researchers would obtain their required material through various databases (*e.g.*, JICST) or other private arrangements. Recognizing that MT would not give high quality output, the MT equipment would serve them in a "scanning" mode. That is to say, that assuming an English abstract were available, one would desire a "rough" translation of the full-text article. Then, based on an evaluation of the MT output, one could decide whether a full-text manual translation was warranted. The principal points to be made in utilizing the MT equipment were ease of use of the equipment (could the individual researcher operate it himself; "reasonable" translation quality; and minimal expense (com-pared to full text manual translation).

With these objectives in mind, a market survey was conducted to determine the availability of systems. The first point to be emphasized is that although a number of these systems are marketed in Japan, none

were (and are still not today) available for export. However, even with this limitation, it was deemed useful to continue the evaluation, with the prospect that the same manufacturers were generally thinking about export sales, in the future.

A characteristic not clearly evident from the outset that contributed to simplicity of operation or lack thereof, was related to the necessity of pre-editing Japanese text, prior to executing the machine translation. Related to this requirement was the need for a system that included an integrated Optical Character Recognition (OCR) capability.

As can be imagined, the various manufacturers of MT equipment have provided differing capabilities in the OCR performance and pre-editing requirement.

We performed a simple “beta” test by providing a sample technical article to the manufacturers, requesting that they translate the material using no pre-editing. Without going into a detailed discussion of the differences in translation quality, the significant point is that some systems provided a complete translation, whereas others only translated partially, as a function of the required input pre-editing rules. We did not make comparative tests of OCR capabilities.

From a review of the trial translations, and the fact that all the systems investigated utilized Japanese computer screen commands, we concluded that the use of an MT unit by a researcher without extensive training, at lease in the present state of the art, is not viable.

Establishing an in-house MT capability therefore, requires a Japanese trained supporting staff. Certainly, if the volume of translation were high enough this would be justified.

However, as described above, the expected usage by U.S. Army Laboratories is considered more casual in its use. As a result of attending a number of trade shows and making contacts in Japan, it was brought to our attention that the business demand for translated material in Japan (J/E as well as E/J) has spawned a small industry of MT translation service companies. The thought came to us that it might be possible to engage these service companies to satisfy the three objectives stated previously: ease of use, reasonable quality, and minimal expense.

A new dimension now entered the equation -- timeliness. Although the translation function could be automated, the use of the mail was thought to introduce an undesirable delay. Also, the use of facsimile might contribute sufficient degradation to render inputting of the material difficult. The solution hit upon was to devise a network concept utilizing electronic mail (e-mail) technology.

The procedure observed was to first concentrate on the assets of JICST. The researcher would access either JICST-E or JICST-J via JOIS, depending on the degree of sophistication of his information resource. After finding suitable abstracts he would contact the MT service company in Japan, and have them order the full text journal or proceeding material. Since JICST headquarters and the translation service company are co-located in Tokyo, this would minimize the handling time. Once in the hands of the translation service company the material would be translated, and then forwarded by e-mail to the researcher.

In some instances in which the researcher obtained information independently of JICST, he would forward it to the translation center by e-mail, with the same type of turnaround described above. This, of course, might entail the necessity of an OCR. We have not analyzed this aspect of the approach in any detail.

Cost remains an important factor. Obtaining comparative costing is difficult, but as a basis for comparison, we cite the basic JICST cost for full text translation, i.e., $41 for 400 *kanji* characters (J/E) which is about 10 cents per character.

The target cost for MT service companies is ¥2 per character. At ¥120 to the dollar, that amounts to 16 cents per character. Thus, MT cost is about 16 percent of full text translation.

There is an additional cost and complexity introduced by use of an electronic mail network. The approach taken here was to employ existing, established public information network services, e.g. CompuServe, GEnie, etc. These services presently have connection capabilities, via a local telephone access, to Japan. Thus, the communication charge incurred consists only in a local telephone call, an additional charge being that of time on the network, which is nominal. The challenge in setting up this procedure related to the ability to transfer Japanese or English text from the United States to Japan and

vice versa. We were able to confirm that with an appropriate *Kanji* capable personal computer and associated communication software this could be accomplished.

We have been investigating the obtaining of Japanese Scientific and Technical information and rendering it useful for some time. At the present, good use of MT requires considerable specialized support. Some of the network architecture we have proposed and investigated appear to be attractive alternatives to solve this problem.

Use of Computer Translation by U.S. Companies

Mr. David Andrews, Chief Executive Officer, InterLingua

The focus of this paper is the use of computer translation by U.S. companies. My firm, InterLingua, provides services locating and identifying Japanese information, liaison and negotiation for information acquisition and computer translation for Japanese and English.

The typical perception of computer translation is discouraging. Most of our new clients say that they looked at computer translation in the past and thought that the results were a joke. You put Japanese in one end and rubbish comes out the other. Well, that has been the case in the past but recently the quality of output has increased dramatically. We've found that as more Japanese companies have entered the market and the programming techniques have increased, the overall quality has increased.

But, it's still not the kind of capability you see in science fiction movies. The concept of a system where anyone can type in his native language and a perfect translation is produced is just not reality. The translation systems available today should not be thought of as a substitute for human beings.

However, they can be considered as a tool to bring what I like to think of as the worlds' second oldest profession: translation, up to date. It really is an excellent way to reduce costs and speed up the process, if it is used correctly.

At InterLingua, we receive most of our documents in hard copy form, especially Japanese documents. The reason is that there are hardly any PC's in the United States that run the NEC operating system and so hard copy documents are almost always shipped from Japan. This poses a big problem: do you re-input the Japanese text by hand or can you scan the pages and use optical character recognition to automatically convert hard copy or a facsimile to a machine compatible text format? If the information is available on disk the process is simplified greatly **(See Figure 1)**.

If you have a Japanese Optical Character Recognition (OCR) technology, the process is simplified greatly. If you don't, you need a bi-lingual person who can input Japanese to capture the text. It is probably worth mentioning at this point that not all Japanese speakers can use Japanese word processing systems, it's not like English where a knowledge of spelling is all you need.

Once we have scanned the document and run it through the optical character reader, the text must be formatted for the translation system. This requires checking the OCR for accuracy, splitting up long convoluted sentences and simplifying areas where we know the system will fail. Also, we pull out charts, graphs, illustrations and matrices. These must be processed manually or the text formatted for the translation system.

The translation system produces raw translation that has some problems: words that are not in the dictionary have to be added, sentences that have failed due to length or complexity must be edited and the document put through the system again. On difficult documents, it can take three or four passes to get it right. On simple documents twice is usually enough. The original charts, graphs and matrices can be added back at this time.

The document can then be provided to the client over fax, E-mail or in hard copy form. At this point, the client reads the document or uses the global search capability on word processing systems to find areas that have potential. Other areas that need more clarification are also identified for editing. The client identifies areas of interest and faxes back to us for final editing.

The last step in editing cleans out areas that are needed and ignores the rest, unless the client requires a full edit. If the document is needed for publishing, higher levels of editing and formatting can be provided.

Figure 2 shows the typical levels of editing required. The first level is raw computer translation output, usually required for content search of a document or just a table of contents, or to quickly gain an understanding of a document such as correspondence or a news item.

The second level, selective edit, is used to expand on areas that the translation system has not processed well or to clean up specific areas of interest. The third level, finished translation, is for text that must be

used in documents verbatim. The last level, finalization, is for documents that require the highest level of translation and formatting. Obviously, it is not necessary to go through each level to complete the document. You can go from computer translation to finalization in one step.

Now let us look at the typical use of computer translation to get the best results. The three key areas could be described as information evaluation, information selection, and translation acceleration.

The first information evaluation is where the translation software is used to evaluate large amounts of information. In the past, this required a translator to read the document and then provide a synopsis for review. Now it can be done with as little human intervention as possible by passing the document through the translation system. Next, the document can be visually scanned or computer scanned to reveal key words or even sentences. This is a very low cost, quick process that can be used as a competitive tool by companies that need to keep tabs on their Japanese competitors or companies that need to monitor activities in Japan.

The limitations are that there must be comprehensive dictionaries in place to make the most of the document. In our particular case, we develop special dictionaries for clients that use this service regularly to supplement the regular dictionaries. Another limitation is that the client must be instructed on how to get the most of the output. The first time you read computer translation output it may be a complete puzzle. But the real benefit is in the transfer of the concepts. If you read it correctly, the meaning comes through in almost every case. The third limitation is in charts, graphs and matrices. This is primarily due to limitations on the part of the optical character recognition system that has been used. We are currently perfecting a system to eliminate boxes and lines, and to re configure text to allow the translation systems work effectively.

This process fits documents like long reports, and even short reports for that matter. Magazine articles and newspaper articles where the immediacy of the information is more important than the perfection of the English translation and for manuals and text books where a search for specific content is required.

This brings me to the second application: information selection. This application provides users with a very low cost, quick tool to find specific subjects that are buried in large documents. The biggest benefit is the fact that it is very convenient in that it does not require a translator to read the document. A process that can often take days or even weeks to accomplish. In addition, because the system can be taught to translate even the most difficult and arcane words, it does not need a highly specialized translator.

The limitations have to do with the input constraints, such as perfect bound documents that must be photocopied first. This presents a problem for all but the most sophisticated OCR software because if the page is photocopied a little askew, the OCR software can easily misread the characters. In our latest version of our OCR software however, this has problem has been eliminated. The other limitation, as mentioned previously, is in the dictionaries. The effort in perfecting and constantly adding to dictionaries is well worth it. This process is really suited to any kind of document as long as you deal with the dictionary issues.

Translation acceleration is the third key application of computer translation. I can speed up the process immeasurably by removing a great deal of the initial reading that the translator has to do in Japanese. As I'm sure most of you know, Japanese sentences do not need to have the subject. This means that the entire sentence must be read before the translator can start his or her job. With computer translation, much of that work is done by the machine. Another benefit is that an initial content check can be conducted by a lower-cost, non-bilingual person because the system provides the original Japanese and the English, side by side. A checker can look through and identify areas that are missing.

The limitations are mainly on the part of the translator. Many translators that have been doing their job manually for years say that the computer translated first step slows them down. This intractability can be a problem. We often train our translators from scratch and help them see that the computer output is a good starting point. The final limitation is one of the subject itself. We have found that for legal or very technical subjects, the computer translation process does not add any value.

So, in terms of suitability, long, simple documents that have a very tight deadline provide the most benefit. The following three cases show how computer translation is best used:

The first is a situation where three Japanese government documents totaling some 1400 pages that had a substantial overlap in content were translated in just eight weeks. As a comparison, one similar book had taken our client almost 9 months to have translated conventionally. After optical character scanning, the computer translation system was used to quickly provide a first step for editors that identified overlap and allowed us to focus on rebuilding the three books into one. The text, having been developed by the Japanese government, was very pedantic and old fashioned in construction. This slowed the process down.

The second case history is that of a technical manual that totaled 750 pages. The subject was mechanical engineering, an area where we have put a lot of effort into dictionary development. The language of the original Japanese was very down to earth and practical. The translation process took a total of just four weeks. Human translation would probably taken over three months.

The third and final case in point is a research report that totals 100 pages. The information contained in the report was very timely and valuable but only if our client could get their hands on it immediately. Our first step was to translate the table of content, so as to allow our client to select the most important areas to be processed. The whole translation process, including charts was one week. Human translators would have needed at least one month.

To recap, computer translation systems today should be considered information access tools, not substitutes for human translators. Computer translation should be used to speed up the process of translation, to lower the cost of translation and to provide a way to understand and use information to generate a more competitive economic climate with Japan.

FIGURE 1

Third Annual NTIS/JICST Conference

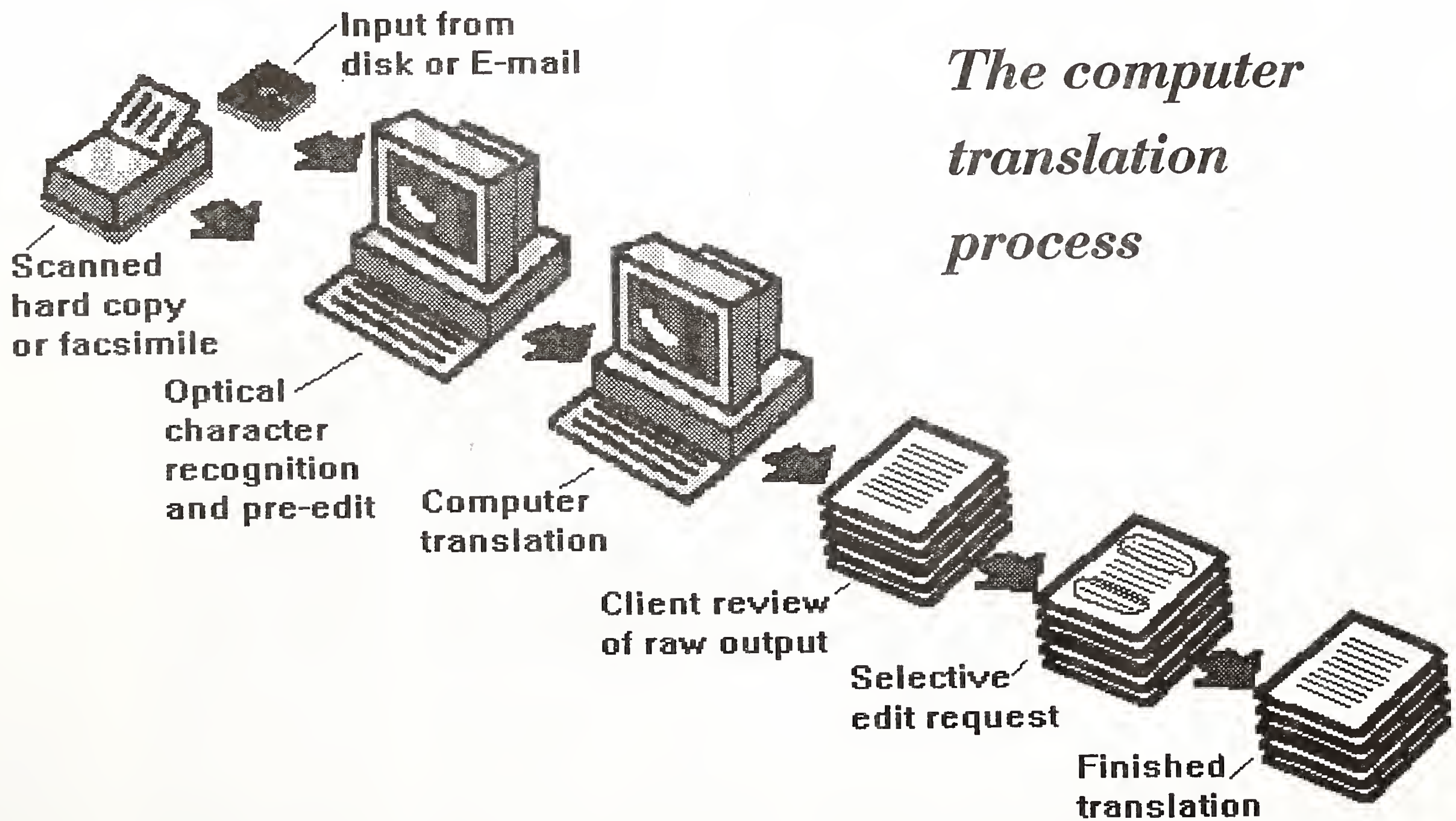


FIGURE 2

Levels of editing

Editing Level	Typical Use
Raw Computer Translation Output	Scanning to look for usable content
Selective Edit	Clarification of areas
Finished Translation	Use in presentations or as part of another document
Finalization	Publishing of document in target language

Part VIII. Creating a Program for Japanese S&T Information Within your Organization

Creating a Program for Japanese S&T Information: A Model and Experience in Washington State

Ms. Betty Tonglao, Coordinator, Pacific Rim Project,
Seattle Public Library

I want to share with you our experience on collecting and disseminating business, industry and technology related information through establishing a statewide network of libraries -- a network of academic and public libraries. I feel obligated, however, to make a qualifying statement before going further. Because of the nature of our consortium, STI-related matters are often implicated in the business context. Now -- back to the world of libraries -- an institution with a history centuries long, but with a new twist of meaning in the 1990s.

It is often assumed that the academic libraries are to support research and the curriculum needs within their academic community. Therefore, collecting business and S&T information is often a given. But, on the other hand, people will inevitably ask, "Why the public library?" For many of us, we carry with us the impressions formed in our youth of what a public library in our neighborhood can provide. For those who have not had the opportunity to explore beyond such formed impressions in their adult professional lives, they are often astonished to find what many of the public libraries are doing today for their business communities. This is particularly true in the urban setting. After hearing from people I encounter outside of the library setting, I have this line etched in my mind: "I have never thought the library would have this kind of information." Many have discovered that the business information resources in many of the larger public libraries are an important sources of information for businesses of all types and sizes.

Washington is a state where its natural resources, agricultural products, and one giant aerospace company have been dominating our state's economy over the past several decades. We are beginning to readjust our thinking by expanding into international trade in other areas beyond relying solely on the traditional exporting industries. Facing the dynamics of the global economy of the 1990s and the coming century, medium and smaller businesses will need to think globally in order to

survive. And quite often, resources within many of these companies simply are not equipped to embark on the necessary information gathering as fundamental as to study potential foreign markets, or to locate potential contacts overseas, or to identify a technology developed elsewhere across the world.

Public libraries in our state are making an attempt to bridge the information gap. The example that I would like to use today is the Pacific Rim Business Information Service. It is entering the seventh year. With an initial three year grant from a private source, we formed a consortium of information and service network focusing on "matters" relating to doing business with the economies in the Asia-Pacific Region. As I look back, there were a few rather unique aspects of that effort.

The first unique feature was the collaboration between two metropolitan areas in two states -- 180 miles apart -- namely Portland, Oregon and the Seattle area. Incidentally, totally unrelated, this concept of regional cooperation has manifested into a more formalized governmental cooperation called "Cascadian Corridor," covering the Canadian province of British Columbia, and the states of Washington and Oregon for the common purpose of economic development of the region. One other unique aspect of this cooperative effort was that the collaboration involved two university libraries and three large public systems located in the two metropolitan areas, with the advisory-type of support from two major corporate libraries. For those of you who are not librarians, "cooperation" has been a buzz word for a long time, but cooperation between or among different types of libraries still rarely happens. This kind of resource sharing has certainly expanded the breadth and depth of our coverage -- each naturally complementing the others.

The third element, perhaps the most critical component that has given this project its own identity -- is that this collaboration is focused. The project pinpointed a specific area of information that was needed -- the need that has been reflected on university campuses and by the growing international business communities. After identified, we focused our collection effort on issues relating to current economy, business, trade, industry and technology of the economies in that region. For the public library setting, and in the context of this program, our primary clients or targeted clients have been companies that are currently doing busi-

ness with that region and those who are contemplating or preparing to expand into that region. Both types of companies often need information on what to, where to, and how to, if not when to. This was the case then when we first started and, we believe, is still the case today.

I think society, as a whole, especially on the West Coast, is more acutely aware of the economies west of us -- well, if we travel east far enough we reach the Far East which is west of us! Frank Gibney's 10-part Pacific Century" series, which aired on PBS late last year, further testified the fact that Asia cannot be ignored as an area of opportunities and cooperation. With such information needs as our backdrop, we defined the scope of our cooperative collecting effort. Five years later, this vision has been transformed into a similar network of information and service within the state of Washington. Now we have a network of the nine largest public library systems, located at key business centers across the state, a state library, and the University of Washington libraries.

To share resources, we created a database to track holdings of up-to-date and relevant titles, such as directories, journals, reports monographs, CD-ROM products, and databases. For example, if someone wants to stay current on technological developments for commercial purposes in Asia, the Seattle Public Library has an air-mail subscription to the *Asian Review of Business and Technology* published in Hong Kong. Knowing how accessible it is, there is currently very little reason for another subscription within the consortium. Another example was a list of current and relevant publications that was generated by the database for a presentation on how and where to locate Japanese business information to the Japan-America Society. The topics range from business etiquette to garbage management, from *keiretsu* to management techniques, from electronic industry to the R&D in biotechnology. The intent for such a tracking system is to provide information that is relevant for doing business with Japan today and tomorrow, but not yesterday.

The other important aspect of this cooperative effort goes far beyond identifying, might I add "expensive" resources to share. This program has a built-in requirement of providing easy access. Beyond what is electronically accessible, easy access requires a strong and critical link of a people network. One designated librarian at each of the participating libraries acts as the facilitator and is responsible for developing their

own library's resources as well as bringing the information needed from a remote site to his or her local clients. As a result, there is a great deal of communication among libraries, and between an individual library and myself as a key liaison.

As an example, a participating library in an agricultural community in eastern Washington was trying to locate the exporters of reconditioned forklift trucks from Japan. This inquiry was beyond their own resources, however, and with the right directory in the consortium, we faxed the addresses to them on the same day. We also rely on resource people outside of our state. I recall one occasion last year where a local business tried to identify the Japanese company that developed a method of piping the sunlight into an enclosed area of a structure -- such as the basement of a building. After we exhausted our own resources, we called the Commerce Department's Japan Technology Program for the answer. It has been our experience that information resources per se do not manifest themselves in a vacuum or in the absence of a network of information facilitator acting as connectors. The Japan Technology Program and NTIS are an important information clearinghouse and critical connectors encouraging greater in-flow of STI from Japan.

In summary, based on our experience over the years, to successfully build and run a program such as ours -- a few ingredients are essential: the leadership of at least one institution to spearhead toward addressing a common concern in defined geographic area; after the group is formed, the other essential ingredient is the long-term (three to five years) institutional commitment toward the project for implementation; to make a cooperative project work effectively team spirit and team work or a human network is critical.

The information is out there, but the pivotal difference is this service and how we structure the service to make the information available to our clients. In our particular case, the strength of our services does not just rest upon one individual institution, but relies on the human network that successfully integrates the resources and accessibility for our end users.

PACIFIC RIM

BUSINESS INFORMATION
SERVICE — WASHINGTON

PACIFIC RIM BUSINESS INFORMATION SERVICE - WASHINGTON

Fact Sheet

What is the Pacific Rim Business Information Service - Washington (PRBIS-WA)?

The Pacific Rim Business Information Service is for businesses interested in doing business in the Asia/Pacific countries. The service is a cooperative effort sharing information resources and expert knowledge of librarians of ten large public and academic libraries across Washington State. This pilot project is an extension of an earlier five-year old program and currently funded by the State Legislature through the Washington State Library.

What is covered?

Geographically speaking, the service covers the Asia/Pacific region: Australia, China, Hong Kong, Indonesia, Japan, Malaysia, New Zealand, Pacific Islands, Philippines, Russia (in particular Far East), Singapore, South Korea, Taiwan and Thailand. The subject matters range from economy, trade, business, industry to science and technology issues relating to the region as well as to the individual economies in the region.

Who are the participating libraries?

The libraries are Fort Vancouver Regional Library, King County Library System (Bellevue, Federal Way and Kent Libraries in particular), Pierce County Library District, Seattle Public Library, Spokane Public Library, Tacoma Public Library, University of Washington libraries (advisory), Washington State Library, and Yakima Valley Regional Library. This cooperative effort is led by the Seattle Public Library during this demonstration period (1992-93).

Where do we obtain the information?

The service acquires current and up-to-date information from a wide variety of domestic and foreign suppliers. Books, magazines, directories, videocassettes, annual reports, market reports, statistical annuals, U.S. and foreign government publications, and on-line or CD-ROM databases are all utilized. While most of the materials are available in English language for users' convenience, materials in original languages may also be obtainable.

How does it work?

Telephone or visit the participating library nearest you or call the toll-free number (1-800-462-9600). Librarians will assist you to locate information you need within the consortium network or elsewhere. Information and materials may be relayed by telefacsimile or through other delivery services provided by the member libraries.

TOLL-FREE LINE: 1-800-462-9600

Participating Libraries: Fort Vancouver Regional Library • King County Library System: Bellevue Library; Federal Way Regional Library; Kent Regional Library • Pierce County Library District • Seattle Public Library • Spokane Public Library • Tacoma Public Library • Washington State Library • Yakima Valley Regional Library

Technical Translation or Technical Japanese?

Dr. Michio Tsutsui, Technical Japanese Program, University of Washington

It seems to be a commonly accepted view among specialists in science and technology that America must make much more effort to import science and technology information (STI) from Japan in order to maintain its competitive position in the technological world. In fact, data concerning the global position of Japanese technology, and the quality and amount of Japanese technical information seem to validate this view.[1]

A substantial amount of Japanese technical information is available in English, too. A number of technical journals from Japan are published in English and it is a common practice that technical journals published in Japanese provide English abstracts. Some of the major Japanese technical journals are also released in English translation after their initial publication. In addition, database service organizations such as JICST and NACSIS provide highly comprehensive databases containing STI in English from articles published in Japan. However, it remains the case that a great portion of STI, including Japanese patent information, is available only in Japanese. It should also be pointed out that the most up-to-date STI is usually not available in English.

Presently there are two approaches used to obtain information from materials written in Japanese. The traditional and still dominant approach, "technical translation," is to obtain English translations of materials published in Japanese. The other and more recent approach, "technical Japanese," is to draw technical information directly from original materials by training engineers and scientists in technical Japanese language. These approaches differ radically.

Technical Translation

Advantages: the major advantage of the translation approach is, of course, time. In other words, this method of information access involves a time commitment by someone other than the document user. And

it involves saving not only the time away from the job spent in document interpretation or translation but also the time away from the job spent in technical language training.

The translated document itself can be considered a second advantage of this approach. Once the document exists in translated form, the information is available for widespread use. In other words, one person's effort is available for use by others.

These advantages seem to indicate that this approach to technical literature is efficient and therefore preferable. But, in fact, the translation approach has several serious drawbacks.

Disadvantages: first, the cost of translation from Japanese to English is usually very high. For example, according to the 1991 rate offered by JICST, a double-spaced document costs $40 per page (400 Japanese characters of 26 lines per page). This means that translating a single-spaced five-page article with some figures from Japanese to English costs about $650. Additionally, there is no cost reduction for document translation on a massive scale.

Second, and perhaps even more important than cost, the life span of technical literature -- and therefore technical translation -- is usually quite short. Thus, although it is true that a technical document translated into English can benefit many, the document itself becomes useless fairly quickly.

Third, time can also be considered a disadvantage with this approach. Translation takes time; in fact, large documents can take months to translate. Therefore, information may not be available when it is needed. In other words, despite the fact that a short turn-around is crucial in technical translation, obtaining translations in a short period of time can be difficult. One reason is that, at this time, translation is mostly done by man not by machine, and a human translator's daily productivity is limited. Additionally, problems often exist with the original texts, for example, unclear writing, unfamiliar concepts and terms, typos. For translators without backgrounds in technology (and there are many), sorting out these problems frequently causes additional delays.

Fourth, quality is another problem with technical translation. Technical translators usually work under strong time pressures, which often cause them to sacrifice quality in order to meet deadlines. In addition, there are a number of situations which contribute to mistranslations. For example, many technical materials are not well written in terms of clarity and they are seldom error-free. Often, translators are not experts, are not familiar with the topics of the documents they are translating, and may not understand the content of those documents. In addition, technical experts and other information sources are often not available to assist them. Because accuracy is crucial in technical translation, the seriousness of this problem cannot be overemphasized.

The final and most important problem of the translation approach is the gap between the amount of technical literature in Japanese and the availability of translation manpower. Because technical translation requires highly specialized linguistic skills involving language and technical knowledge, there are only a few highly-skilled technical translators in the U.S. and it is unlikely that number will change dramatically in the future.[2] On the other hand, the volume of technical literature in Japan has been increasing steadily. For example, the volume of Japanese articles in engineering, technology and applied sciences from 1986-90 was 23.7 percent more than that from 1981-85 and the volume of articles in life science from 1986-90 was 35.7 percent more than that from 1981-1985.[3] Similarly, Japanese patent publications in 1989 and 1990 numbered 61,000 and 63,000, respectively, and those in 1991 are estimated to be 81,000.[4] With such limited translation resources, it is obvious that we cannot deal with this increasing volume of technical literature in Japanese.

Is Machine Translation a Solution?

Given the situations discussed above, it is natural to expect to employ machines in technical translation. An ideal MT system would certainly be a solution to the problems of translator shortages, high costs, and long turn-around times.

Unfortunately, however, current MT technology still has difficulty handling such problems as long *kanji* compounds, long noun phrases, and deeply-embedded sentences, not to mention context- or knowledge-dependent ambiguity, inter-sentential references, and ill-formed sentences, and is not able at this time to replace skilled human translators.[5]

MT systems which are currently in use usually require pre- and post-editing by man and the materials these systems can translate are limited. It should be noted here that post-editing still requires the linguistic and technical knowledge that skilled technical translators have. In other words, machine translation still requires human translators. Thus, MT at this time cannot solve the problems of technical translation.

Technical Japanese

Disadvantages: this approach to acquiring technical information directly from S&T literature in Japanese involves training engineers and scientists in technical Japanese language. With this method, then, time -- that is, the time it takes to learn technical Japanese -- can be seen as an initial disadvantage. In other words, the direct access approach requires a solid time commitment at the outset from the individuals in training and, if they are in the work force, from the companies employing them.

In addition, with direct access, information obtained by the individual user may not be accessible to others unless the user releases the information in some way. These disadvantages, however, can also be viewed as advantages.

Advantages: first, the time committed to language training can be viewed as a short term disadvantage only. Although the time involved may seem lengthy initially, the long term pay-off is great.

In fact, technical Japanese can be learned in a relatively short period of time for several reasons. Since technical Japanese is a subset of Japanese, it involves a smaller number of *kanji* and vocabulary.[6] In addition, the grammar needed in reading and understanding technical Japanese is limited. A further reason is that the meanings of technical terms are basically the same cross-linguistically--and there is no need to learn non-technical meanings of needed terms if those exist. Also, because the objective in reading technical literature is to gain specific

information only, the reader's task is simplified. And, since the understanding of technical literature is heavily dependent on technical knowledge, the reader brings prior skills to the reading task.

A second and obvious advantage to the direct access method is cost. That is, this method is free from expensive translation costs.

Another advantage of the direct access approach is that direct access allows engineers and scientists to obtain the information from technical materials with no delay. In other words, if they can read Japanese, the technical information is available to them as soon as the material is in-hand. In addition, users can choose what they want to read from a given article since they may need only a portion of the article. It should be pointed out that when an article is translated, it is usually translated in its entirety whether or not the whole article is necessary.

A fourth and very important advantage is that there are fewer risks of misinterpretation with the direct access approach. Experience in teaching technical Japanese tells us that an accurate interpretation of technical literature is more dependent on technical knowledge than on Japanese language knowledge. In other words, an expert of semiconductors with intermediate-level Japanese skills can read materials on semiconductors more accurately than a non-expert of semiconductors with advanced Japanese knowledge.

Fifth, while translated technical materials usually have relatively short life spans, Japanese language skills do not. Rather, the more one uses the acquired language skills, the more one can improve those skills and the more accurately and quickly one can read. In other words, the gain from an investment in Japanese language training lasts much longer than that from an investment in technical translation.

Sixth, this approach is free from the problem of translation manpower shortage. Given the present pace of technological development, there is no question of an even greater increase in S&T literature in the future. On the other hand, there is no indication of a sharp increase in technical translation resources in the near future. This means that if the U.S. keeps depending on translation, the manpower shortage will be a very critical issue. The direct access approach could end this problem.

Although the seventh advantage of the direct access approach was listed above as a possible disadvantage, it can also be considered an advantage. That is, technical information obtained by users themselves from materials unpublished in English could be used to benefit the individual user more or less exclusively. In other words, the information is not necessarily available for widespread use, which could be a competitive advantage.

Finally, but not less importantly, engineers and scientists trained in technical Japanese can take advantage of the speaking and listening skills they acquire while studying Japanese. Thus, using those skills they can also obtain technical information not available in written form. In fact, these skills enable them to exchange the most up-to-date technical information verbally.

Suggestions

It is this author's view that the above discussion clearly indicates that the direct access approach to technical literature should be seriously undertaken. A number of things must be done in order to promote this approach.

First of all, the environment for technical Japanese studies must be improved. Academic institutions with strong engineering and science programs should establish programs to promote technical Japanese studies. Internships in Japan should be part of such programs. At present, despite the serious need for such programs, there are only a handful in the U.S. (See Appendix.) This situation must be improved.

Academic institutions should also develop special curricula for technical Japanese training. Because technical Japanese requires somewhat different skills from traditional language training, traditional curricula is not quite applicable to this kind of language training.

In addition, courses must be developed that can be delivered to "remote" learners, individuals who cannot attend regular classes.[7] Developing an effective hardware system to deliver such courses is also necessary.

Appropriate teaching materials and self-study materials are also an urgent need. Computer software is one possible form of such materials.

Finally, it is important to develop tools to aid in reading technical Japanese literature, such as on-line dictionaries for technical Japanese. Because most non-native readers are heavily dependent on dictionaries when they read Japanese documents, a powerful on-line reference would be an enormous help.[8]

In order to execute these projects, support from the two governments and corporations is essential.

Conclusion

Technical translation may be an indispensable means to acquire technical information from Japan, but it can no longer be the only means. The single most promising alternative is to train engineers and scientists in technical Japanese and thereby obtain information directly from original materials in Japanese. Technical Japanese training *is* the long-term best investment for both sponsors and learners. The gains may not seem immediate, but they guarantee the future.

Endnotes

1. U.S. General Accounting Office (1992).

2. According to Ron Granich, President of Japan Communications, Inc., only 400 qualified Japanese-English technical translators are available at this time.

3. *Science Watch*, Vol. 2.4; Vol. 2-8 (May, Sept. 1991).

4. Kelley (1992)

5. Tsujii (1989) and Ishizaki and Ishara (1989)

6. Daub, et. al. (1990) claim that the 365 *kanji* introduced in *Basic Technical Japanese* cover 80 percent of the *kanji* in a typical technical text. In this author's view, however, a knowledge of 1100-1200 *kanji* is necessary for reading professional technical articles efficiently.

7. At present, the University of Wisconsin delivers Basic Japanese and Intermediate Japanese courses through National Technological University's teleconferencing network.

8. The University of Washington's Technical Japanese program is currently developing a computer-assisted technical Japanese tutorial system which includes an on-line dictionary.

References

Daub, Edward E., R. Byron Bird, and Nobuo Inoue (1990). *Basic Technical Japanese.* University of Wisconsin Press.

Inshizaki, Shun and Hitoshi Isahara (1989). "Bunmyaku-joohoo Honyaku System CONTRAST (Contextual Information Translation System CONTRAST)." *Joohooshori*, Vol. 30, No. 10.

Bibliography

Ketley, A. Donald (1992). "Acquiring and Exploiting Information in Japan: The Case of High Technology," in *Information Sources on Japanese Science and Technology* (Conference Proceedings), Japan Information Access Project.

Science Watch, Vol. 2.4; Vol. 2.8 (May, Sept. 1991).

Tsujii, Jun-ichi (1989). "Shizen-gengo-rikai no Rekishi to Genjoo (History and Present Status of Understanding Natural Languages)." *Joohooshori,* Vol. 30, No. 10.

United States General Accounting Office (1992). *High-Technology Competitiveness: Trends in U.S. and Foreign Performance* (GAO/NSIAD-92-236).

Appendix

Technical Japanese Programs in the U.S.

Engineering Alliance for Global Education (EAGLE)
(Cornell, University of Wisconsin-Madison, Lehigh, Georgia Tech, North Carolina State, University of California-Berkeley, University of Texas-Austin, Rose-Hulman, SUNY-Buffalo, Texas A & M, University of Illinois-Champaign-Urbana, Temple, University of New Mexico)
Telephone: (608) 263-2191
Fax: (608) 263-0839

Massachusetts Institute of Technology
The MIT-Japan Program
Telephone: (617) 253-8095
Fax: (617) 258-7432

National Science Foundation
NSF Summer Institute in Japan
Telephone: (202) 653-5862
Fax: (202) 653-5929

National Technological University
Management of Technology Program
Telephone: (303) 484-6050/(215) 758-3427
Fax: (303) 484-0668/(215) 758-3655

Stanford University
Stanford Center for Technology and Innovation
Telephone: (415) 725-0239
Fax: (415) 725-7355

University of Cincinnati
International Engineering Program
Telephone: (513) 556-5174
Fax: (513) 556-3626

University of Michigan
Japan Technology Management Program
Telephone:(313) 763-3258
Fax (313) 936-2948

University of Washington
Technical Japanese Program
Telephone: (206) 543-7610
Fax: (206) 685-3264

University of Wisconsin, Madison
Japan Engineering Leadership Program
Telephone: (608) 263-2191
Fax: (608) 263-0839

Vanderbilt University
U.S.-Japan Program in Management of Technology
Telephone: (615) 343-8913
Fax: (615) 343-6983

3M's Corporate Strategy for Japanese S&T Information

Ms. Claire Z. Stokes, Supervisor, 3M Information Services

3M's International Operations

3M is a diversified manufacturing company, serving industrial, commercial, health care, and consumer markets worldwide. 3M has moved into the global marketplace, and has operations in 57 countries, with manufacturing in 42 and research laboratories in 22. 3M products are now being sold in more than 200 countries.

3M's international operations began in 1951, and by 1973 sales outside the U.S. had grown to $1 billion. In 1992 just over 50 percent of 3M's worldwide sales of $13 billion were from 3M subsidiaries and joint ventures outside the United States. About 38,500 of 3M's 85,000 employees are located outside the United States.

Information Services

Information Services is the primary source for technical and business information resources for 3M personnel worldwide. This department contributes to 3M's global competitive advantage by providing answers to all information requests, and access to appropriate information materials. In addition, we play an active role in improving access to internal technical information and expertise, and providing leadership in the effective use of information.

3M's need for international information has paralleled its business growth in the global marketplace. Our 3M clientele want the information we provide to encompass global markets. Requests for information specifically on foreign firms are becoming more and more frequent. 3M management, researchers, and marketing staff can not ignore foreign competition, so we are obliged to expand our range of resources for finding the information they seek.

One way that we have increased our information resource base is by working in collaboration with the staff of fourteen 3M libraries/information centers operating outside the U.S. In 1988 we held our first International Information Conference at corporate headquarters in St. Paul, Minnesota. This internal conference brought together 3M staff from around the world who are engaged in information retrieval. Since this conference, there have been a number of other visits and short job exchanges among information professionals in the United States and Germany, France, the United Kingdom, and Japan. All these staff visits facilitate understanding and the flow of information that reaps benefits for the entire company.

Japanese Competition

3M faces keen Japanese competition for a number of our products. A case in point is the competition faced by our Memory Technologies Group. This group produces consumer video and audio products, data storage products such as diskettes and computer tapes, and optical recording devices such as compact discs. For many of these product lines, 3M is the only U.S. company still actively engaged in research and development, and the competition is almost entirely Japanese.

Serving 3M's Need for Japanese Information

Information Services acquires resources for obtaining information about Japanese companies and technologies, and we continue to watch for new sources. Our Business Library maintains a collection of annual reports on Japanese companies who are major 3M competitors. We also subscribe to journals and newspapers covering Japanese business, such as the *Asian Wall Street Journal* and *The Nikkei Weekly*. The search staff in the Business Library use the *Jiji Press Ticker Service* and the *Kyodo English Language News Service* online for corporate and business news. Other databases being used are *Nikkei Telecom Japan News Retrieval* and the *Teikoku Databank*.

Technical information resources covering Japanese developments are also being acquired, such as the *ILO Monthly Newsletter*, *Techno Japan*, and *Japanese R&D Trend Analysis: Advanced Materials*. The patent literature is used to monitor Japanese technologies. The patent search

staff access the *World Patent Index, INPADOC* and *JAPIO*. Examined applications published by the European Patent Office (EPO) from Japanese firms are monitored to detect trends from Japanese competitors. These applications must be made in a language accepted by the EPO, eliminating the need for a Japanese translation.

Programs to Increase Use of Japanese Information

Being aware of resources and how to best use them is a constant challenge in the information retrieval business. As the person assigned by Information Services to monitor the area of Japanese information resources, it is my responsibility to insure that our department is using the best information resources available for tracking Japanese technologies. Our job is to spread the word to the researchers and other staff that can utilize these sources in the course of making business decisions. Towards that end, we have published two issues of an internal publication, the *Information Link*, highlighting Japanese information resources.

Besides obtaining the right resources and publicizing them, our third approach for delivering Japanese information involves establishing and using our internal network of information professionals. Extremely important to us are the contacts we have at Sumitomo/3M. Our Director, Barbara Peterson, has established good relationships with Japanese staff providing business and technical information services. Visits to the U.S. by the Japanese staff have taken place. We are able to obtain Japanese documents with the assistance of this staff. Their assistance with translations is a real asset. We are also fortunate enough to have a Japanese national located in St. Paul who is assisting with translations on a contract basis.

Plans for Improved Services

A near-term goal within Information Services is the development of a Global Information Strategic Plan. A component of this plan will focus on access and use of Japanese information. Although this plan is not complete, our vision for the Japanese information component is starting to take shape.

We envision a more formalized process for information exchange between staff at Sumitomo/3M and the staff of Information Services. For example, we hope to contact Japanese staff during routine visits to corporate headquarters for an orientation to Information Services. Besides giving them information about services available from us, we will be soliciting their help in acquiring Japanese information.

We will continue networking with 3M information professionals in other countries, including Japan. This may be in the form of a Second International Information Conference, or it may involve video conferencing with those colleagues. We expect that joint efforts and working groups with members from any number of countries will form in the future.

One of our goals is to retain a Japanese speaking staff member to work with us in St. Paul. This person would be involved in information retrieval and would assist our Divisions that face major Japanese competition.

Always in our thinking is the need for increased awareness of our growing capabilities to deliver Japanese information. Towards that end we are considering a number of mechanisms for increasing that awareness. We may facilitate an internal forum for individuals involved in tracking Japanese developments or competitors. This group could share ideas, resources and strategies for acquiring this information.

We also watch with great interest developments from the Japanese and U.S. governments for improving the information transfer between the two nations. We appreciate the efforts from JICST, NTIS and the Department of Commerce, and the Japan Information Access Project and look forward to future exchanges such as the one afforded by this two-day conference.

Creating a Program for Japanese S&T Information Within Your Organization

Ms. Dawn Talbot, Information Manager, Center for Magnetic Recording Research, University of California, San Diego

The faster and further you move information, the more expensive it becomes.
Glen McG. Renfrew, Reuters, Managing Director

This seems a very apt quote for a seminar on locating and acquiring Japanese scientific and technical information (STI). Along with distance and speed there is the added component of language. These factors add up to "expensive." For those of you working in this area this will come as no surprise. Although Japanese STI is still not as easily accessed as the scientific and technical literature from the United States, this situation is changing. In the nine years that I have been involved in Japanese information, I have seen a definite acceleration over the last few years in efforts, notably by the Japanese, to make their information more accessible.

The Japanese have expended vast human and monetary resources in tracking information from the West. Indeed this has been a constant criticism of the Japanese by Americans -- that the information flow is one way, from the United States to Japan -- that it is not reciprocal. Where I disagree with many of these critics is that I consider the problem ours rather than Japan's. We were unwilling to look beyond our own borders, confident that we would remain at the forefront of research and development in most, if not all, high tech areas. We stopped requiring foreign language training for scientists and engineers, we curtailed the accumulation of scientific and technical literature from other countries if it was not published in English. Faced with a similar situation, Japan has successfully developed strategies over the last 40 years to tap information from abroad.

Before developing any information gathering program, I would suggest you realistically assess the information needs of your organization. Many U.S. companies are unaware of, or reluctant to admit, their need

for Japanese STI. One of the phenomena that many of us working in this area over the last 10 years have noticed is that there is a need but no demand in this country for Japanese STI.

In order to assess your Japanese STI needs consider the following:

- Ask yourself whether the types of information discussed over the past two days would be of benefit to your organization.
- Is this likely to be an occasional or frequent need?
- Who is responsible for satisfying the company's need for technical information not related to Japan? Perhaps you have a technical information service or library already in place? Could this department handle Japanese information?
- Perhaps your scientists and engineers retrieve needed information for themselves from a nearby academic research collection or use some other outside resource? Could this be utilized for Japanese information?
- Do you have an office or subsidiary in Japan which could be tapped? Perhaps you have a Japanese joint-venture partner?
- Is there any technical Japanese language expertise within your staff?
- How much are you prepared to pay?
- How comprehensive do you want to be?
- Are you comfortable with contracting outside for these services or would you prefer to keep this in-house?

There are 4 major stages in tracking published Japanese STI, as I see it; one, identifying what is being published in Japan; two, selecting the right amount of relevant material -- the filtering process; three, procuring actual documents; and four, translation where necessary.

What is Being Published in Japan in Targeted Fields Of Science & Technology

I am going to start not with the actual publications or primary sources, but instead start with the secondary sources -- the so-called abstracting and indexing services, since these provide the easiest, most cost-effective method for getting to a range of the primary literature. While many of these services are available in print form, we also have machine readable versions offered through a variety of database vendors such as Dialog, STN, etc. These machine readable databases provide numerous indexing points and cover hundreds or even thousands of titles.

Perhaps the most straight forward are the English-language databases with an international scope. Of those that cover Japanese sci-tech material some of the most important are INSPEC; NTIS; Chemical Abstracts; Predicast's PROMT; Predicast's International Newsletter Database; and NewsNet. Most of the Japanese material included in the aforementioned sources are in English, since translation of Japanese information into English can be prohibitively expensive for the database producer.

For more comprehensive coverage however, one needs to go to databases that focus on Japan. The databases I will mention are available in the United States. There are others produced in Japan, in Japanese, that are not available in this country. Although I will not discuss these, one should be aware of their existence if comprehensiveness is important. Should there be a Japanese-language database core to your field, it may be worth the effort to have it searched in Japanese on your behalf.

The major Japanese system which comes to mind is JOIS from the Japan Information Center for Science and Technology (JICST). The JICST-E file has been available in the United States since 1987, although its coverage dates back to 1985. It covers some 4,000 journal titles. JICST has also started to include government reports in its file, but this is uneven coverage, since Japan is not yet committed to a centralized repository of government report literature.

Initially abstracts were provided for only about 30 percent of the file. This has been steadily improving and is now approaching 50 percent. English-language abstracts are provided by the authors or are produced by the JICST machine translation system and then post-edited. By far the largest number of abstracts are still provided by authors rather than by machine translation.

Recently I compared 81 records retrieved from the Japanese-language version of the JICST database with the English-language database. Forty-four percent of those records had an English-language abstract available in the English database. However, some 14 percent were not available at all in the English-language version due to the time delay before records are added to the English-language database. For my users, and I would guess for most users, abstracts are critical, particularly as an aid in determining whether it is worth the expense to acquire the article and especially in helping to decide whether translation is warranted. For those requiring abstracts for all records, JICST, Tokyo will conduct searches of the JICST-J database on a one-time or weekly basis. Of course the results will be in Japanese and will require translation.

Material is added to the Japanese-language database approximately six months after publication. Another three months generally elapse before we see these records appear in the English-language database. This means that a nine-month time lag is common. For those requiring very timely information, JICST has another early version of the database in Japanese called JQUICK. Begun in 1990, it is designed for rapid access to published information, but does not include abstracts (except for author created abstracts), nor does it include the added index points found in the JICST databases.

Another available file again from JICST is the Japanese government and Public Research in Japan (JGRIP) file. This covers research in progress and research completed within the last five years from public, national, and local government research organizations. In 1991, about 28 percent of the file included abstracts. As well as providing information on current research it is a good source for identifying "experts" in a particular field and as such provides a good starting point in pursuing personal contact. Unfortunately, it does not include research being

conducted in Japanese universities or the private sector, so this limits the usefulness of this file given the importance of corporate research in Japan. In my own field this is a distinct limitation.

JAPI (Japanese Information on Scientific and Technical Topics), produced by Eurobrokers sarl, Luxembourg and offered through Data-Star, is an interesting file. It covers 1987 to date and generally includes material six months after publication. DataStar has very recently been acquired by DIALOG, so I expect we will see the DataStar databases offered via a DIALOG interface in the near future. The JAPI file purports to cover the so-called "grey literature" or information outside mainstream publication. About 70 percent of the file covers conference publications. Since many are not covered by the JICST file, this seems to be the real strength of this file. About 29 percent of the file covers journal articles, most of which are covered by the JICST files. The remaining 1 percent accounts for technical reports, research reports, internal publications, interim reports etc.

The *Teikoku* database available on DIALOG, and Nikkei Telcom have been covered elsewhere in this seminar, so I will not go over them again. The NACSIS databases have also been covered but I will mention them again since they are not well known here, probably due to their limited access and also because many of them are only in Japanese. As of February 1992 the NACSIS databases are Grant-In-Aid Scientific Research; Dissertation Index; Conference Papers of Academic Societies and Associations; Scientific Papers, Series I Electronics and Series II Chemistry; Exchange of Information on Research Projects (EX-IRPTS); Private Grants-In-Aid Research; Electronic File of Academic Conference Papers (tentative); and Directory of Researchers.

Currently, access to these databases is being offered outside Japan via leased lines to the British Library and selected British universities, and in the United States at the Library of Congress and the National Science Foundation (NSF).

Another category of information whose usefulness to the sci-tech community cannot be stressed too strongly is that of patents. This has already been dealt with in a special section at this meeting, so I will not elaborate. The Japanese patent database JAPIO which was until recently an exclusive file on Maxwell Online (now InfoPro Technologies) is

now offered through DIALOG. The World Patents Index (WPI) is also a good file for Japanese patents in selected areas and is a useful tool for filtering significant Japanese patents.

I will now go on to the primary sources of information -- journals published in Japan. The Japanese are voluminous publishers with currently some 10,000 titles being published in science and technology alone. I would recommend identifying major Japanese publications in one's area of interest and subscribing to them. The majority of these publications will, of course, be in Japanese. There does seem to be a trend, however, to include more English-language access points such as translated titles and an abstract. Often there is an English-language table of contents. If there is not, then translation of these should be considered.

It is interesting to note the differences in scientific and technical publishing in Japan compared with the United States. The referred journal is not common in Japan. Typically one might find new research reported in a house organ or perhaps in the proceedings of a small technical meeting. These would usually be in Japanese. This same work may be later published in a more commercial Japanese journal. It may be published yet again in an English-language publication from outside Japan, often as the proceedings of a conference where the work has been presented. The time lag for this English-language version may be as much as two years, so one can see the importance of scanning the patent literature and Japanese-language sci-tech material for early warnings of new technology. And of course, the percentage of Japanese research that is presented in English is but a small percentage of the total, and it represents only the top strata of research.

The so-called "grey literature" -- the noncommercially published sources, remain the most elusive. Bibliographical control of this material is poor in Japan, often giving rise to the myth that the Japanese are particularly secretive. In my experience, they are no more secretive than we are in the United States, since much of this information would be classed as proprietary in either country. Often contacting the author or sponsoring organization is the only channel for acquiring this information, and the request should be written in Japanese.

Newspapers and trade journals are a useful source of technical information in certain fields. Unlike the United States, major newspapers carry considerable news of new products and scientific and technical research. There are also a number of industry-specific publications that can be useful windows to Japanese technology. Publications from industry-specific groups can also prove to be very useful particularly if there is a group which matches you own area of interest, such as the Magnetic Media Industries Association or the Electronic Materials Manufacturers Association of Japan.

Another emerging format for information is electronic information on the INTERNET. Although not pervasive, there are sites in Japan which connect to the INTERNET. David Kahaner, a numerical analyst on sabbatical to the Office of Naval Research, Asia, is located in Tokyo and writes regular reports summarizing meetings he has attended in Japan and elsewhere in Asia. These are posted to a USENET Newsgroup called comp.research.japan. This Newsgroup was set up with grant funding from the U.S. Office of Naval Research and is moderated at the University of Arizona by Dr. Rick Schlicting. This electronic forum was established to more widely disseminate research developments in computing and computer science from Japan. Along with the Kahaner reports are the contents pages of several Japanese journals relating to Japanese computing. These include both English and Japanese papers. Also included are announcements related to computing and computer science in Japan, including conferences, and research opportunities, queries and general discussion, both academic and industrial. If you are unable to access the USENET Newsgroup, you can also access this information by subscribing to the electronic mailing list res-japan-group.

Filtering

By now you are probably getting the idea that there is a lot of information out there, admittedly much of it redundant, and some of it of questionable value. With experience, one is able to determine which publications and which databases provide the most "bang for the buck." Initially, I would encourage casting one's net wide in setting up a systematic monitoring service to track Japanese STI. After awhile, it will be evident that some sources, particularly databases are not appropriate or yield too few useful results.

It is interesting to note here the different information seeking behaviors of Japanese compared with American researchers. In Japan, information gathering or competitive intelligence is a highly regarded activity. Vast sums of money and human resources are expended in gathering large quantities of information. This attitude does not prevail in the United States. Instead, we expect targeted retrieval of highly relevant material at little or no cost.

Avoiding duplication of resources will reduce costs, but of course a very narrowly defined research profile will inevitably miss pertinent information. This may or may not be acceptable. I would stress again that you should be clear on what it is you want to achieve from your Japan program -- comprehensive, or highly focused results? Do you want everything on the subject or just a few relevant references? What are your needs? Tailor the program accordingly!

Procurement of the Documents.

I have often been referring to citations or pointers to the actual information rather than the information itself. In most of the databases mentioned the full text of an article is not included, instead there is the information to point you to the journal and hopefully an informative summary. Getting hold of the actual paper can present some challenges.

Your options are as follows:

1. Large academic research collections

Japanese-language technical journals are not widely held in U.S. research libraries. Although you may start with a university research collection if there is one close by, this may be a less-complete resource than you would expect. MIT, Ohio State University and a private scientific and technical collection -- the Linda Hall Library in Kansas City have significant Japanese collections, but again, their coverage of current sci-tech materials in may still prove inadequate for your needs. While this can be a low-cost route, it can also be a time-consuming route. If the library does not hold the titles you are looking for, they may offer a service (for a fee) to locate a source and retrieve the required document. I do not suggest using Japanese academic libraries,

since unlike U.S. libraries, this is not a service they provide on a routine basis. We may see some changes in this area due to the influence of NACSIS, but it will not happen quickly.

2. Commercial document delivery companies

While these services advertise fast, efficient turnaround, I have found they often falter when it comes to anything but the most straightforward Japanese materials unless they specialize in Japanese information. They are also often reliant on academic research libraries as their sources. They will also charge accordingly if they are required to go outside their usual channels of supply. However, two excellent commercial sources for Japanese STI are JICST, Tokyo, and the British Library Lending Division, Boston Spa, United Kingdom. If you expect to make frequent use of these organizations, they offer deposit accounts to expedite the process. Speedy access is available via electronic mail to send requests to these sources.

3. Subscriptions to Japanese journals

Another method for acquiring Japanese information is to subscribe to Japanese journals in your research area. These should be acquired through an agent specializing in Japanese journals and the same goes for technical books from Japan. One complication with publications from Japanese professional societies is that they often require you to deal with them directly rather than via an agent and that you pay in yen rather than dollars.

4. Japanese Patents

These can be very easily and inexpensively acquired from the British Library Patent Express Service. One nice feature of this service is the slight enlargement, which makes the Japanese characters more legible, which is imperative if you are going to have the patent translated.

Translation

I come now to the final stage in the information seeking process and that is translation. Since this is an expensive operation, there are a number of steps which I would recommend before a custom translation is ordered. First, look at the original in Japanese. For technical articles,

the language of numbers is universal. Perhaps there are sufficient tables, graphs, charts, etc. to give you the information you need without going to the expense of translation.

Next, look to see if there is an English-language equivalent. For patents, the patent families information on WPI may yield a U.S. patent or even a European equivalent which will not require the expense of Japanese to English translation. For Japanese technical articles, a search should be conducted to see if the authors did indeed publish in an English-language publication. There are also translation journals which publish cover-to-cover, or selectively, from Japanese language journals. In my own field the *IEEE Translation Journal on Magnetics* is a good example. Yet, another under utilized resource is the World Translation Index, maintained jointly by the Library of Congress and the World Translation Center in Delft, Netherlands. This database publishes listings of custom translations which companies and institutions have had prepared and are now offering for sale. These are sold at reasonable cost. One warning here is that generally very recent articles will not show up here. In my own subject area, this has not been a particularly useful resource.

Once you have decided that custom translation is the only alternative available I offer the following tips; in order to reduce costs work directly with a translator rather than an agency if at all possible; ensure the technical as well as language competence of the translator and ask to see examples first; be specific about what your needs are i.e., exclude author biographies; translate patents for readability of technical information rather than a literal translation for legal use. The claims section can go on for pages without a sentence break. This can be very difficult to read; ask for a quotation and be clear on turnaround times. Expect to pay a lot for rush jobs; and provide clean originals (Japanese characters can be very hard to read from third generation photocopies). You will be paying for your translator's time as he struggles to read characters.

CMRR strategies

CMRR is a consortium of the University of California and 13 American companies involved in the magnetic storage industry, primarily mass storage for computers. Our funding comes from our corporate spon-

sors and from federal grants. A small percentage is contributed by the University of California. We aim to train graduate students and to further basic research in the technology of magnetic recording. We provide an information service for members of our companies, for our faculty, and for our students. Japanese information is not our only concern -- we cover information from worldwide sources. However, since Japan is a major competitor in our business, not surprisingly, we devote considerable time and energy to Japan. Many of the strategies I have mentioned are ones we have adopted at the center. Since I work in a relatively narrow are, many of these methods have proved quite successful. If I was faced with a much broader-based subject area I would expect the task to be far more difficult.

Although certainly not comprehensive, we provide a window on Japan which complements other resources used by our companies. We have certainly have increased the amount of pertinent information available to our companies in this area. Our services include

- A monthly alerting service to our members which includes Japanese information

- Searching databases both international and Japan specific. We also have a weekly profile running against the JOIS database and translate the results into English

- Scanning current journals, including relevant Japanese titles for pertinent information, translating tables of contents where necessary

- Procuring any documents or patents requested by our users using many of the sources mentioned

- Providing a subsidized, custom translation service. In order to improve the quality of our translations and maintain consistency we have prepared a dictionary of frequently occurring technical terms for the magnetic recording industry

- Creating in-house databases for our Japanese translations and also for the Japanese technical articles and patents.

CMRR has a small, highly specialized collection of books, videotapes, directories, and journals on magnetic recording which does include Japanese language materials. However we have also developed efficient access to vast resources within the University of California system, within the nation, and internationally.

BRIEF SOURCE LIST OF JAPANESE STI

Directories

Talbot, Dawn E., *Japan's High Technology: An Annotated Guide to English-language Information Sources.* Oryx Press, 1991. Phoenix, Arizona.

EC-Japan Center, *Directory of Sources of Japanese Information.* EC-Japan Center for Industrial Cooperation, Tokyo, Japan, First Edition, 1988, Second Edition, 1993.

Directories by the Japan Information Access Project, 1706 R St., N.W., Washington, D.C., 20009-2410, Telephone, (202) 332-5224, Fax, (202) 332-6841.

Directory of Japanese Databases in 1992, Annual, Tokyo, Database Promotion Center, 1992, Ichibuncho-81, Bldg 5F, 6-4 Ichibuncho, Chiyoda-ku, Tokyo 102, Japan, Telephone 81-33-221-6161, Fax, 81-33-221-6226

Database Vendors

DIALOG Information Services, Inc
4640 Admiralty Way, Suite 722
Marina Del Rey, California 90292
(800) 334-2564

STN International
c/o CAS
2540 Olentangy River Road
P.O. Box 3012
Columbus, Ohio 43210-0012
(614) 447-3600

NewsNet Inc
945 Haverford Road
Bryn Mawr, Pennsylvania 19010
(800) 345-1301

Document Delivery

Linda Hall Library
5109 Cherry St
Kansas City, Missouri 64110
(816) 363-4600

Japan Information Center of Science and Technology (JICST)
5-2 Magatocho 2 chome
Chiyoda-ku Tokyo
C.P.O. Box 1478, Tokyo, Japan
81-33-581-6448

British Library
Document Supply Center
Boston Spa, Wetherby
W. Yorks, United Kingdom
33-0937-84-3434

British Library, Patent Express
25 Southampton Bldgs
London, WC2A 1AW
United Kingdom
33-01-323-7927

Agents for Japanese Publications

Japan Publications Trading Company
IPO Box 5030, Tokyo International
Tokyo 100-31, Japan
81-33-292-3753
81-33-292-0410

Kinokuniya Book Store Co Ltd
Offices in San Francisco, Los Angeles, New York

Maruzen Co Ltd
P.O.Box 5050 Tokyo International
Tokyo 100-31, Japan
81-33-278-9223

The Importance of Information in Japan

Mr. Toshiyasu Sasaki, Executive Vice President, Japan Information Center of Science and Technology (JICST)

In Japan, the importance of information is well understood by government, industry, and academia. With this in mind, a variety of information activities are carried out by individuals or organizations. For this presentation, I would discuss five typical examples: researchers in Tsukuba Science City; ERATO research project managers; *sogo-shosha*; corporate employers; and engineers of industrial companies.

Tsukuba Science City is a concentrated area of 50 Japanese national laboratories and universities and about 150 private research institutions. In order to maintain the information flow among such a large number of institutions, there is STA's Tsukuba Center for Institutes and the Tsukuba Research Consortium, established by private companies. With the help of these organizations, there are well organized human networks among researchers in a variety of research fields, particularly among the younger-generation researchers.

Such information-sharing networks are characterized by the following: 1) they are open to every researcher; 2) they provide free communication for individuals rather than a particular institution's staff; 3) they offer good human relations that encourage smooth information flow; 4) the participants are highly intelligent; and 5) there is a broadness of research fields that enables interdisciplinary exchange. Such human networks have been successful because of the creative, research-oriented atmosphere in Tsukuba.

The Exploratory Research for Advanced Technology (ERATO) program of JRDC is a semi-governmental organization funded by STA as part of the Japanese government's policy to promote creative research. The research themes are selected from the most promising fields. These fields are defined based on the trends in basic research and technology development as analyzed by several information sources. For example, information sources for overall, international R&D trends include *STA's White Paper on Science and Technology*; the Prime Minister's Council for Science and Technology's *Basic Policy for Science and Technology*; and U.S. reports on science and technology.

For a more detailed analysis of S&T trends, the following reports on Japanese-government funded research are helpful: *Advanced Scientific Research of Academic Institutions Supported by Grant-in-Aid for Scientific Research of the Ministry of Education; Advanced Research Supported by the Special Coordination Funds for Promoting Science and Technology of the STA;* and *MITI's R&D Program on Basic Technologies for Future Industry.* In addition, the themes of keynote speeches, invited speeches, and important S&T conferences or symposia are reviewed and analyzed.

Information on human resources is also taken into account. The following factors are considered: 1) authors of technical reports (as identified through JOIS); 2) invited speakers to academic meetings; and 3) winners of scientific prizes.

The *sogo-shosha* (large-scale trading company) is a business information source of global scale. The staff is provided with current news immediately after it is received from the branch offices located worldwide. The news is exchanged among the staff daily by telephone, facsimile, or telex through the company's global telecommunications network. Each *sogo-shosha* also recognizes its role as an information provider to its customers.

In a booklet prepared by Japanese trading companies, entitled *What can we do for you?*, the following description is given of a typical *sogo-shosha*'s vast information network that provides timely information as one of its main business functions. The booklet makes special note that

1. The *sogo-shosha* has 10,000 employees stationed in 180 overseas offices.

2. Each piece of information is coded to specify a file category, screened, processed, and then stored in a mainframe computer.

3. Manufacturers are provided with information about markets so that they can best control their inventories, plan production, and invest wisely.

4. Exporters are given information about overseas markets and the activities of competitors.

5. Investors are provided with information on business climates, currency exchange rates, and currency regulations.

6. To maintain the information systems, including the advanced telecommunications network, this *sogo-shosha* spends more than $60 million annually.

Corporate employers need information on various fields, such as politics, the economy, social trends, and technical developments, as well as financial data on their own company. Their experiences and careers are different from one another. Besides the fact that they are busy. Therefore, the information service for them has to be provided through face-to-face communication with their staff. That is to say, they need non-systemized or individualized information to which access is rather limited. It is not to say, however, that systemized information such as a database like that of the stock market, is not important to them. Combined use of these two types of information is necessary to increase the effectiveness of the information service.

In this connection a survey on information useful to enterprises revealed the following:

1. 80 percent of the total information being collected is written material, and the rest is oral or in other forms.

2. 65 percent of the written material is public.

3. 64 percent of nonpublic information is from outside the company.

The following results of another survey show similar trends:

1. Newspapers and journals got more than 80 percent of the responses.

2. Books, group study, and business connections got more than 60 percent of the responses.

Scientists and engineers, in industry, acquire information (according to a recent survey) as follows:

1. Purpose of information acquired

- Implementation and planning of R&D are highly ranked and followed by management of technology, research and production.

2. Information needed on a specific S&T field is ranked the highest and followed by:

- basic and general STI
- information on products and services
- factual data on S&T
- information on plants and equipments in a specific S&T field
- patent information
- information to back-up a new plan

3. Period needed for information acquisition:

- About 60 percent is acquired in the same day
- 20 percent in several days
- 10 percent in a week

4. Frequency of the use of information source:

- Journals, personal collections, human contact with colleagues, newspapers and books are ranked high,
- Secondary documents and databases produced in their companies as well as those of other companies are also used.

What I have just discussed is, to some extent, uniquely Japanese but I hope you will more or less learn from such practices. Japan is geographically isolated from the rest of the world by sea and we have consequently built up a unique culture which sometimes make our way of conducting business difficult to understand for foreigners. As a part of the Japanese government's efforts to lessen such difficulty and to

contribute to the international society, JICST will continue conferences, such as this one, every year--once in the U.S. and once in Europe. I hope that such efforts will be useful for the global dissemination of Japanese STI.

Finally, I would like to express our appreciation for the continuing support of the U.S. Department of Commerce and NTIS, who have been essential for the success of this conference. I would also like to extend my appreciation to speakers from both the U.S. and Japan for their remarkable contribution and for their voluntary participation.

Part IX. Directory

The following resource directory is designed to help you locate the conference speakers and exhibitors. It will identify their organizations and show their institutional context so that you can best evaluate how to use these sources. Conference speakers' names are italicized.

DIRECTORY

Selected Sources for Information Gathering on Japan

JAPANESE GOVERNMENT

● OFFICE OF THE PRIME MINISTER

SCIENCE AND TECHNOLOGY AGENCY
Science and Technology Information Division
Science and Technology Promotion Bureau
2-2-1, Kasumigaseki
Chiyoda-ku, Tokyo 100, Japan
Telephone: 81-33-581-5271
Fax: 81-33-595-0567
Minister of State for Science and Technology: Mr. Kanzo Tanigawa
Vice Minister: Mr. Takuya Hirano
Parliamentary Vice Minister: Mr. Hideo Niki
Deputy Minister: Mr. Kenichi Murakami
Director: Mr. Tateo Arimoto
Deputy Director: Mr. Yoshinari Akeno

STA operates under the auspices of the Office of the Prime Minister. It coordinates Japan's science and technology policies.

JAPAN INFORMATION CENTER OF SCIENCE AND TECHNOLOGY (JICST)
International Programs
2-5-2 Nagata-cho
Chiyoda-ku, Tokyo 100, Japan
Telephone: 81-33-581-6411
Fax: 81-33-593-3980
President: Mr. Muritaka Nakamura
Executive Vice President: Mr. Toshiyasu Sasaki
Deputy Information Manager: Ms. Yukiko Sone
International Programs Counselor: Mrs. Hisako Uchida
General Manager: Mr. Toshihiko Watanabe

Founded in 1957 to gather and disseminate international science and technology information. JICST is part of the science and technology agency which is under the Prime Minister's office. The JOIS database (JICST Online Service) is available through STN or by contacting NTIS. There is an abbreviated English-language version called JICST-E and JICST has recently initiated a translation and document delivery service.

In the U.S. contact the

JICST Washington Office
1550 M Street, N.W.
Suite 1050
Washington, D.C. 20005
Telephone: (202) 872-6370
Fax: (202) 872-6372
Director: Mr. Ken-ichi Iwasaki

RESEARCH DEVELOPMENT CORPORATION OF JAPAN (JRDC)
Science Building
5-2, Nagata-cho 2-chome
Chiyoda-ku, Tokyo 100, Japan
Telephone: 81-33-507-3052
Fax: 81-33-581-1486
President: Mr. Nobuhisa Akabane
Telephone: 81-33-507-3022
Fax: 81-33-581-1486
Department of Technical Development:
Mr. Hideo Aoyama, Counselor
Manager, Office of Planning: Mr. Takashi Nitto

• MINISTRY OF EDUCATION

NACSIS
3-29-1, Otsuka, Bunyo-ko
Tokyo 112, Japan
Telephone: 81-33-942-6949
Fax: 81-33-942-9398
Director General: Dr. Hiroshi Inose
Associate Professional Systems Research Division: Dr. Jun Adachi
Director, Science Information Research Division: Professor Hitoshi Inoue
NACSIS Newsletter Secretary:
Mr. Tatsuo Kaida

The National Center for Science Information Systems (NACSIS) of the Ministry of Education, Science and Culture was founded in April 1986. NACSIS is a central organ for promoting the service of national and comprehensive science information systems. NACSIS' primary service is online access to the science data bases associated with Japan's Ministry of Education, Science and Culture. NACSIS also provides a newsletter which is available free of charge. Some Westerners sometimes mistakenly identify this organization as Japan's National Science Foundation.

NACSIS

One of the most important programs that the NSF administers in regard to Japan is a cooperative venture with Japan's Ministry of Education, Science and Culture to allow **free** access to NACSIS (Japan's National Center for Science and Information System) database. This program, funded by the Japanese government, allows any American free access to 12 bibliographic Japanese databases, many that have been previously unavailable in the U.S. All are in the Japanese language. The NSF and the Library of Congress provide free, brief, translations and searches. Information tends to be dated.

Some of the NACSIS databases now accessible to the U.S. research community include

KAKEN: compiled by NACSIS, these are abstracts of research projects subsidized by grants-in-aid for scientific research from the Ministry of Education.

RES: biographical, publication, and research information on researchers at Japanese universities.

GAKKAI 1, 2, 3, 4 & 7: abstracts of papers presented at conferences and meetings of a

number of academic societies in electronics, information processing, electricity, chemical engineering, biotechnology, architecture, civil engineering, medicine, dentistry, botany, and agriculture.

GAKUI: an index to doctoral dissertations submitted to Japanese universities.

KEIZAI: index of economics literature published in academic, professional and official periodicals.

DBDR: directory of databases created or accessible through Japanese universities.

The other databases in the NACSIS system contain the holdings of university libraries (union catalogues) in Japan.

To access the system, contact

NACSIS Operator at NSF
Operator: Mr. Larry Garfield
Telephone: (202) 357-7278
(between 1:00 p.m. and 4:00 p.m., EST on weekdays)

NOTE: This project has been temporarily suspended due to funding. For more information, contact Mr. David Stout, (202) 357-9717 or the Library of Congress at (202) 707-1207.

JAPAN REPROGRAPHIC RIGHTS CENTER (JRRC)
6-41, Akasaka 9-chome, Minato-ku
Tokyo 107, Japan
Telephone: 81-33-475-4621
Fax: 81-33-403-8199
Executive Director: Dr. Ohiko Kammori

Established September 1991. Helps improve flow of scientific and technical information between the U.S. and Japan. Provides Japanese publishers and authors with licensing programs and a means to collect royalties on works they have published, both within Japan and in other countries.

● MINISTRY OF FOREIGN AFFAIRS

EMBASSY OF JAPAN
2520 Massachusetts Avenue, N.W.
Washington, D.C. 20008
Telephone: (202) 939-6700
Fax: (202) 328-2187
Ambassador: His Excellency Shoichi Kuriyama

Deputy Chief of Mission:
Mr. Hiroshi Hirabayashi
Political Minister: Mr. Kenzo Ohshima
Economic Minister: Mr. Seiichiro Noboru
Commercial Minister: Mr. Masatoshi Toriihara
Financial Minister: Mr. Shoji Mori
Information Minister: Mr. Seiichi Kondo
Scientific Counselor: Mr. Yukihide Hayashi
Defense and Military Attache:
General Shunichi Nito
MITI Representative: Mr. Atsuo Sibouta

- Japan Information and Culture Center
  1155 21st Street, N.W.
  Washington, D.C. 20036
  Telephone: (202) 939-6900
  Fax: (202) 822-6524
  Director: Mr. Motokatsu Watanabe

- Japan Information Center
  299 Park Avenue
  18th Floor
  New York, New York 10171
  Telephone: (212) 371-8222

Fax: (212) 371-1294
Director: Mr. Seigi Hinata

- Japan Information Center
  Olympia Center
  737 North Michigan Avenue
  Suite 1000
  Chicago, Illinois 60611
  Telephone: (312) 280-0430
  Fax: (312) 280-6883
  Director: Mr. Ko Kodaira

- Japan Information Center
  50 Fremont Street
  Suite 2300
  San Francisco, California 94105
  Telephone: (415) 777-3533
  (415) 777-0518
  Director: Mr. Eiichi Suzuki

- Japan Information Center
  250 East First Street
  Suite 1507
  Los Angeles, California 90012
  Telephone: (213) 624-8305
  Fax: (213) 680-3202
  Director: Mr. Takeo Yoshikawa

- Japan Information Center
  100 Colony Square Bldg.
  1175 Peachtree St., N.E.
  Atlanta, Georgia 30361
  Telephone: (404) 892-2700
  Fax: (404) 892-5067
  Cultural Division: Ms. Hisako Dozai
  Public Relations Director: Mr. Takeshi Takemori

JAPAN ECONOMIC INSTITUTE (JEI)
1000 Connecticut Avenue, N.W.
Suite 200
Washington, D.C. 20006
Telephone: (202) 296-5633
Fax: (202) 296-8333
President: Dr. Arthur Alexander

Research organization funded by the Japanese Ministry of Foreign Affairs. The largely American staff (Keidanren traditionally sends a researcher) produces a series of excellent reports on U.S.-Japan relations and Japanese political, economic, and business issues. The Institute is a good place to look for answers to political and general business-related questions. They are not helpful with company- and industry-specific inquiries. Produces an annual report of Japanese investment in American manufacturing.

Subscription publications are (both reports $150/year):

JEI REPORT (Two-part weekly. Part A on a relevant aspect of the Japanese economy or Japan-U.S. relations; Part B is a newsletter on Japan-U.S. developments.)

JAPAN-U.S. BUSINESS REPORT (monthly on U.S. and Japanese investments and agreements.)

• MITI: Ministry of International Trade and Industry

DATABASE PROMOTION CENTER (DPC)
World Trade Center Building
7th Floor
2-4-1 Hamamatsu-cho
Minato-ku, Tokyo 105, Japan
Promotion Director: Mr. Keisuke Okuzumi
Telephone: 81-33-459-8581
Fax: 81-33-432-7558

MITI-sponsored, quasi-governmental agency founded in 1984 to promote, fund, and study databases and data services in Japan. Their an-

nual *Directory of Japanese Databases* is a **must** for anyone interested in Japanese information. Abridged version available in English.

JAPAN EXTERNAL TRADE ORGANIZATION (JETRO)
1221 Avenue of the Americas
44th Floor
New York, New York 10020
Telephone: (212) 997-0400
Fax: (212) 997-0464
Library: (212) 997-0412
President: Mr. Hiroshi Tsukamoto
Vice President: Mr. Hiri Sumihito
Export to Japan Contact: Mr. Sumihito Hirai
Industrial Electronics Division: Mr. Soichi Nagamatsu
Research Technology Department: Mr. Koshi Ohashi

The New York JETRO office has over 20 departments following trade and technology issues. Departments include industrial research, automotive, bicycles, textiles, ship machinery, and prefectual representatives.

In 1990, MITI began an Import Now campaign and began to reorient the mission and budget of JETRO. Founded in 1958, its mission traditionally has been to collect business and commercial information around the world for Japanese industry.

Other JETRO offices are

- San Francisco: (415) 392-1333
- Chicago: (312) 527-9000
- Los Angeles: (213) 624-8855
- Houston: (713) 759-9595
- Atlanta: (404) 681-0600
- Denver: (303) 629-0404

U.S. Representative in Washington, D.C.:
Mr. Claude R. Shirai, D.C. Liaison
830 National Press Building
Washington, D.C. 20045
Telephone: (202) 293-6958
Fax: (202) 833-2215

> MITI does not have an official office in the U.S. MITI officials sit at the Embassy and JETRO, as well as at most Japanese trade associations located in Washington.

U.S. GOVERNMENT

• COMMERCE DEPARTMENT

The Commerce Department is a wealth of information. Commerce should be your starting point for almost any business question you might have. Consultants and foreign nationals long ago discovered the value of this department's resources. The government agencies that are part of the Commerce Department are: International Trade Administration, National Oceanic and Atmospheric Administration, National Institute of Standards and Technology, National Technical Information Service, National Telecommunications and Information Administration, Patent and Trademark Office, Bureau of the Census, Bureau of Economic Analysis and the U.S. Travel and Tourism Administration.

The Commerce Department's many agencies and services can be overwhelming to the beginning researcher. It is difficult to know where to start to look for information. If you are outside Washington, D.C., start with your local Commerce District Office. However, do not be afraid to call Washington directly.

A central source to direct you to the proper information resource is the

Business Liaison Office
Commerce Department
14th and Constitution Avenue, N.W.
Room 5898-C
Washington, D.C. 20230
Telephone: (202) 482-3176
Director: Ms. Melissa Moss
Business Assistant Program Trade Specialists:
Ms. Nancy Larkin

For information on all U.S. government Japan sources, start with the

Japan Technology Program
14th and Constitution Avenue, N.W.
Room 4817
Washington, D.C. 20230
Telephone: (202) 482-3036
Contact: Dr. Phyllis Genther Yoshida or
Dr. Tom Kusuda

The Japanese Technical Literature Program was established in 1987 by an act of Congress to increase the availability and awareness of Japanese technical literature. The Office's newsletter *Japanese Technical Literature* and its annual *Directory of Japanese Technical Resources* are musts for anyone interested in Japanese science and technology.

Other publications include: *The Role of Corporate Linkages in U.S.-Japan Technology Transfer 1991* and *Japanese Direct Investment in U.S. Manufacturing.*

■ INTERNATIONAL TRADE ADMINISTRATION

Herbert Clark Hoover Building
14th and Constitution Avenue, N.W.
Room 3840
Washington, D.C. 20230
Under Secretary (designate): Mr. Jeffrey Garten
Telephone: (202) 482-2867
Deputy Under Secretary:
Mr. Timothy J. Hauser
Telephone: (202) 482-3917

ITA offers assistance and information to help U.S. exporters. ITA units include country and industry experts and domestic and overseas commercial offices, each promoting products and offering services and programs for the U.S. exporting community.

o Office of Japan

Room 2318
Washington, D.C. 20230
Telephone: (202) 482-4527
Deputy Assistant Secretary:
Ms. Marjorie E. Searing

o Trade Policy

Mr. Philip Agress, Director
Mr. Edward Dunn, Assistant to Mr. Agress, High Technology
Ms. Terrie Etheridge, Structural Impediments Initiative, Construction, MPA

Mr. David Birdsey, Pharmaceutical and Medical Equipment
Ms. Alison Roche, Automotive and Parts
Ms. Beth Johns, Aviation Services, ODA
Mr. Dennis Goldenson, Automotive

- **Commercial Programs**

Room 2324
Telephone: (202) 482-2425
Mr. Robert Francis, Director

- **Japan Export Information Center (JEIC)**

Room 2318
Telephone: (202) 482-2425
Mr. Cantwell Walsh, Director
Mr. Edward Leslie, Deputy Director
Ms. Cynthia Campbell, Associate Director
Mr. Eric Kennedy, Associate Director

The Office of Japan is the country-specific expert on Japan in ITA. The Office of Japan performs two separate and distinct functions: trade policy and trade promotion. The former involves the development and implementation of bilateral and multilateral trade policy and commercial strategies. The latter function is performed by the recently established JEIC. The JEIC offers business counseling and provides current and accurate information on exporting to Japan.

The JEIC provides information on doing business in Japan, market entry alternatives, market information and research, product standards and testing requirements, tariffs, and nontariff barriers. The staff also maintains a commercial library and is available to participate in private- and government-sponsored seminars on various aspects of doing business in Japan.

■ TECHNOLOGY ADMINISTRATION

Under Secretary (designate):
Dr. Mary G. Good
Deputy Under Secretary (acting):
Mr. Mark Bohannon
Telephone: (202) 482-1575

- **Technology Policy**

Assistant Secretary: vacant
Telephone: (202) 482-1581

Office of International Technology Policy and Programs
Director: *Dr. Joseph Clark (acting)*
Telephone: (202) 482-5150
Japan Technology Program: Dr. Phyllis Genther Yoshida, Director, (202) 482-1287
Office of Technology Policy Analyses and Studies Strategic Partnerships Initiative:
Mr. J. William Nelson, (202) 482-2058

U.S. NATIONAL TECHNICAL INFORMATION SERVICE (NTIS)

5285 Port Royal Road
Springfield, Virginia 22161
Telephone: (703) 487-4819
Fax: (703) 487-4636
Acting Director: Mr. Ronald Lawson

- **Office of Business Development**

Associate Director for International Affairs:
Mr. Walter Finch, (703) 487-4674

Agreements Officer:
Ms. Barbara Payne, (703) 487-4826
Japanese Technical Resources Directory Editor: Mr. John W. Hounsell, (703) 487-4819
Foreign Acquisitions: Dr. A. Rahman Khan

Collects Japanese technical literature. U.S. agent for online access to the Japan Information Center of Science and Technology (JICST). The central source for the public sale of scientific and technical reports prepared within the federal government. Many interesting studies on Japan.

Publishes an annual *Directory of Japanese Technical Resources* and *NTIS ALERT: Foreign Technology*, *Daily Report: East Asia*, and *JPRS Report: Science & Technology, Japan.*

To order, call (703) 487-4650

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

Administration Building
Quince Orchard & Clopper Roads
Gaithersburg, Maryland 20899
Public Affairs: (301) 975-2758
Director: Dr. Arati Prabhakar
Deputy Director: Mr. Raymond Kammer
Telephone: (301) 975-2300
Contact: Ms. Sharon Kemmerer, Computer Specialist
Telephone: (301) 975-3287
Fax: (301) 948-1784

● STATE DEPARTMENT

2201 C Street, N.W.
Washington, D.C. 20520
Public Information: (202) 647-6575
Secretary: Mr. Warren Christopher
Deputy Secretary: Mr. Clifton R. Wharton, Jr.
Telephone: (202) 647-9640
Under Secretary for Economic and Agricultural Affairs: Dr. Joan Spero
Telephone: (202) 647-7575
Under Secretary for International Security Affairs: Ms. Lynn E. Davis
Telephone: (202) 647-1049
Under Secretary for Political Affairs:
Mr. Peter Tarnoff
Telephone: (202) 647-2471
Under Secretary for Management:
Mr. J. Brian Atwood
Telephone: (202) 647-1500
Counselor: Mr. Timothy Wirth
Telephone: (202) 647-0978

○ BUREAU OF EAST ASIAN AND PACIFIC AFFAIRS

Room 6205
Assistant Secretary: Mr. Winston Lord
Telephone: (202) 647-9596
Deputy Asst. Secretary: Mr. Peter Tomsen
Telephone: (202) 647-6910
Deputy Asst. Secretary (Japan):
Mr. Thomas C. Hubbard
Telephone: (202) 647-736-4393
Deputy Asst. Secretary (Economic Policy):
Mr. Phillip T. Lincoln, Jr. (acting)
Telephone: (202) 647-6904

Office of Japan
Room 4206
Director: Mr. Rust Deming (to be Deputy Chief of Mission at the U.S. Embassy in Tokyo, starting November 1993)
Telephone: (202) 647-2913
Fax: (202) 647-4402

Political Section
Chief: Mr. John F. Scott
Desk Officers: Mr. David Shear,
Mr. Carl Gettinger, Mr. Kenneth Chern,
and Mr. Drew Quinn
Telephone: (202) 647-2913

Economic Section
Chief: Mr. Robert Ludan
Desk Officers: Mr. Kurt Tong and
Ms. Patricia H. Scruggs
Telephone: (202) 647-3152

○ BUREAU OF OCEANS AND INTERNATIONAL ENVIRONMENTAL AND SCIENTIFIC AFFAIRS

Assistant Secretary: Mr. Curtis Bohlen
Telephone: (202) 647-1554

Science and Technology Affairs
Deputy Assistant Secretary (acting):
Dr. John P. Boright
Room 7825
Telephone: (202) 657-2958
Fax: (202) 647-0773

● DEFENSE DEPARTMENT

The Pentagon
Washington, D.C. 20301
Public Information: (703) 545-6700

Secretary: Mr. Les Aspin
Telephone: (703) 695-5261
Deputy Secretary: Mr. William J. Perry
Telephone: (703) 695-6352

○ DEFENSE LOGISTICS AGENCY

Cameron Station
Alexandria, Virginia 22304-6100
Telephone: (703) 274-6111
Fax: (703) 274-7920
Director: Vice Admiral Edward M. Shaw

Defense Technical Information Center
Building 5, Cameron Station
Alexandria, Virginia 22304
Telephone: (703) 274-7661
Fax: (703) 274-1297
Mr. Robert Billingsley, Chief, Information Programs Support

○ DEPARTMENT OF THE ARMY

Secretary of the Army (acting):
Mr. John W. Shannon
Telephone: (703) 695-3211
Assistant Secretary for Research, Development and Acquisition (acting) :
Mr. George E. Dausman
Telephone: (703) 695-6153
Deputy Assistant Secretary, Research and Technology: Mr. George T. Singley
Telephone: (703) 697-1646

Space & Terrestrial Communications Directorate
Headquarters, U.S. Army Communications-Electronics Command
Fort Monmouth Attn: Amsel-RD-SP-LA-M
Fort Monmouth, New Jersey 07703-5203
Telephone: (908) 544-3900
Fax: (908) 544-2150
Contact: Mr. Robert Brown, Electronics Engineer

○ DEPARTMENT OF THE NAVY

Secretary of the Navy (designate):
Mr. John H. Dalton
Telephone: (703) 695-3131
Assistant Secretary for Research, Development & Acquisition (acting):
Mr. Edward C. Whitman
Telephone: (703) 695-6315
Fax: (703) 697-0172

Office of Naval Research
Asian Office
Unit APO 96337-0007
Telephone: 81-33-401-8924
Fax: 81-33-403-9670
Contact: Dr. David Kahaner
E-Mail: kahaner@cs.titech.ac.jp

The Tokyo Office of ONR is one of the best reporting services on Japanese S&T and R&D developments, especially in the computer and materials field. You can regularly receive their reports online by directly contacting Dr. Kahaner. Also place yourself on the mailing list for their **free** quarterly reports, *Scientific Information Bulletin.*

You can also receive Dr. Kahaner's reports, as well as additional information on Japanese computer science by connecting with the following newsgroup:

Dr. Richard D. Schlichting
Department of Computer Science
The University of Arizona
Tucson, Arizona 85721
Telephone: (602) 621-4324
Fax: (602) 621-4246
Internet: rick@cs.arizona.edu

This newsgroup includes descriptions of current Japanese computing and computer science activities, including reports prepared by the U.S. Office of Naval Research; trip reports on Japanese universities, government laboratories, and companies; information about computer science research papers published in Japan, including titles, authors, and abstracts. This includes papers in both Japanese and English; tables of contents of leading Japanese computer journals; announcements related to computing and computer science in Japan, including those related to conferences held in Japan, research opportunities, etc.; queries related to computing and computer science in Japan; and general discussions on computing and computer science in Japan, both academic and industrial.

● THE WHITE HOUSE

○ OFFICE OF THE U.S. TRADE REPRESENTATIVE

600 17th Street, N.W.
Washington, D.C. 20506
U.S. Trade Representative:
Ambassador Michael Kantor
Telephone: (202) 395-3204
Fax: (202) 395-3911
Deputy USTR: Ambassador Rufus Yerxa
Deputy USTR (Asia):
Ambassador Charlene Barshefsky
General Counsel: Mr. Ira Shapiro
Chief of Staff: Mr. Tom Nides
Counselor on Trade Policy: Dr. Ellen Frost
Congressional Affairs: Ms. Nancy LeaMond

Japan & China
Assistant USTR: Mr. Ira Wolf
Telephone: (202) 395-3900
Deputy Assistant USTR (Japan): vacant
Director of Japanese Affairs:
Mr. Charles D. Lake
Deputy Director of Japanese Affairs: vacant
Telephone: (202) 395-5070

○ NATIONAL SECURITY COUNCIL

OEOB
17th and Pennsylvania Ave., N.W.
Washington, D.C. 20506

Asian Affairs
Special Assistant to the President:
Mr. Kent W. Wiedemann
Telephone: (202) 395-5746
Japan Director: Ms. Sandy Kristoff
Telephone: (202) 395-6173

○ OFFICE OF TECHNOLOGY AND SCIENCE POLICY

OEOB
17th and Pennsylvania Avenue, N.W.
Washington, D.C. 20506
Telephone: (202) 456-7116
Fax: (202) 395-3261
Assistant to the President for Science & Technology: Dr. John H. Gibbons

● INDEPENDENT AGENCIES

○ NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

300 E Street, S.W.
Washington, D.C. 20546
Telephone: (202) 358-0000
Administrator: Daniel S. Goldin
Telephone: (202) 358-1010
Fax: (202) 358-0071
Deputy Administrator (acting): Mr. John R. Dailey
Telephone: (202) 358-1010

NASA Scientific Technical Information Program
Crystal Gateway Building #2
1225 Jefferson Davis Highway
Arlington, Virginia 22202
Telephone: (703) 685-1350
Fax: (703) 271-5669
International STI Program Analyst: Glenn Hoetker

Office of Aeronautics
Associate Administrator: Mr. Wesley Harris
Telephone: (202) 453-2693
Fax: (202) 755-3283

Langley Research Center
Hampton, Virginia 23665
Telephone: (804) 864-1000
Director: Mr. Paul F. Holloway

Research Information and Applications Division
Telephone: (804) 864-2491
Fax: (804) 864-8311
Chief: Mr. Andrew J. Hansbrough
Assistant to the Chief: Dr. Thomas E. Pinelli

● THE NATIONAL SCIENCE FOUNDATION

Division of International Programs
1800 G Street, N.W.
Room V-501

Washington, D.C. 20550
Telephone: (202) 653-5387
Fax: (202) 653-5929
Director: Mr. Marcel Bardon

East Asia & Pacific Section
Senior Program Manager for the Japan Program: Dr. Alexander De Angelis
Telephone: (202) 653-5862
Japan Specialists:
Ms. Patricia Tsuchitani
Mr. Alan Milsap
Telephone: (202) 653-5343

Administers U.S.-Japan scientific exchanges. Occasional reports reviewing R&D and scientific trends in Japan. Reports available: *Directory of Japanese Company Laboratories Willing to Receive American Researchers* (March 1991), *Survey of Direct U.S. Private Capital Investment in Research and Development Facilities in Japan* (January 1991), and *The Science and Technology Resources of Japan: A Comparison with the U.S.* (June 1988).

NSF Tokyo Office
c/o Amembassy, Tokyo
Unite 45004, Box 236
APO AP 96337-0001
Telephone: 81-33-224-5505
Fax: 81-33-582-0496
NSF Officer: Dr. Larry Weber

Tokyo Report Memoranda: Over 200 reports on Japanese science policy developments. For example, Report #221 is *1991 Survey of Research and Development in Japan.*

To be put on the mailing list for these reports, contact Ms. Pandoria Nobles, Acting Secretary, Pacific & East Asia Section, Telephone: (202) (202) 653-5862

> The NSF also administers a project called JTEC (Japan Technology Evaluation Center) to access the status and trends of Japanese research and development in selected technologies (as well as a similar one on Europe, WTEC).

NSF JTEC Program Officer: Mr. Paul Herer
Telephone: (202) 357-9774

CONGRESS

• LIBRARY OF CONGRESS

Japanese Section
Asian Division
Adams Bldg., Room 133B
Washington, D.C. 20540
Telephone: (202) 707-5431
Fax: (202) 707-1724
Head: Mr. Hisao Matsumoto
Area Specialist: Ms. Yoshiko Yoshimura

Far Eastern Law Division
Madison Bldg., Room 235
101 Independence Avenue, S.E.
Washington, D.C. 20540
Telephone: (202) 707-5050
Japan Specialist: Mr. Takeo Nishioka

Science Reference Section
Science and Technology Division
Adams Bldg., Room 5010A
Washington, D.C. 20540

Telephone: (202) 707-5639
Japan Expert: Mrs. Hisako Halasz
Telephone: (202) 707-1207

Business Reference Services
Humanities and Social Science Division
Adams Bldg., Room 5010
Washington, D.C. 20540
Telephone: (202) 707-5522

Congressional Research Service (CRS)
Japan Task Force
Contact: Dr. Richard Nanto
Telephone: (202) 707-7300
Science Policy Research Director:
Mr. Glenn McLoughlin, (202) 707-7073

CRS is the research arm of Congress. Research is vigorous, and the scholars are often among the top in their field. The Japan Task Force coordinates the research work on Japan. Recent studies include:

McLoughlin, Glenn, *Japan's Science and Technology Strategies and Policies: Issue Brief* (#IB 90053)

Nanto, Dick and Glenn J. McLoughlin, *Japanese and U.S. Industrial Association: Their Role in High-Tech Policy-Making* (#91-447E), June 6, 1991

You may obtain these publications through your congressman or senator.

PRIVATE SECTOR

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (AAAS)
1333 H Street, N.W.
Washington, D.C. 20005
Telephone: (202) 326-6640
Fax: (202) 289-4958
Executive Officer: Mr. Richard S. Nicholson
Telephone: (202) 326-6639
Director of International Programs:
Dr. Richard W. Getzinger
Telephone: (202) 326-6650
Contact for Asia/Japan Issues: Dr. Lisbeth Levy

AMERICAN ELECTRONICS ASSOCIATION (AEA)
5201 Great America Parkway
Santa Clara, California 95054
Telephone: (408) 987-4200
Fax: (408) 970-8565
Director of Marketing & Communications:
Ms. Sue Puleo

Washington Office
1225 I Street, N.W.
Suite 950
Washington, D.C. 20005
Telephone: (202) 682-9110
Fax: (202) 682-9111
President: Mr. Richard Iverson
International Affairs Director:
Mr. William Krist
International Trade Affairs Manager:
Ms. Debra Waggoner

Tokyo Office
U.S. Electronics Industry Japan Office
Nambu Building, 3rd Floor
Kioicho 3-3
Chiyoda-ku, Tokyo 102, Japan
Telephone: 81-33-237-7195
Fax: 81-33-237-1237
Executive Director: Mr. John P. Stern

Tokyo office is a joint project sponsored by the American Electronics Association, the Electronics Industries Association, and the Scientific Apparatus Makers Association in cooperation with the Commerce Department. Publishes a monthly newsletter, *Japan Electronics Update*. Also available: *How to Get a Slice of the Japanese Electronics Market: Directory of Purchasing Officers* ($25); *Sources of Electronics Information in Japan* ($45); and *Soft Landing in Japan: A Market Entry Handbook for U.S. Software Companies*.

JAPAN INFORMATION ACCESS PROJECT
1706 R Street, N.W.
Washington, D.C. 20009-2410
Telephone: (202) 332-5224
Fax: (202) 332-6841
Director: Ms. Mindy L. Kotler

Nonprofit [501(c)(3)], nonpartisan, educational organization that trains American public and private sector decisionmakers on how to access, use, and evaluate Japanese business, science and technical information. Offers an information clearinghouse, publications, conferences, and workshops. A membership organization.

MICROELECTRONICS AND COMPUTER TECHNOLOGY CORPORATION (MCC)
3500 West Balcones Center Drive
Austin, Texas 78759-6509
Telephone: (512) 343-0978
Chief Executive Officer: Dr. Craig Fields
Telephone: (512) 338-3227
Fax: (512) 338-3898
Vice President, Strategy and Development: Mr. Mark Eaton
Telephone: (512) 338-3315
Senior Research Analyst, International Liaison Office: Mr. Howard Curtis
Telephone: (512) 338-3792
Fax: (512) 338-3898

Founded in 1982 to foster research cooperation among leading U.S. high technology companies. Extensive information gathering on Japanese science and technology. Monthly newsletter/review of Japanese technical and commercial literature.

NATIONAL CENTER FOR MANUFACTURING SCIENCES
Manufacturing Information Resource Center (MIRC)
3025 Boardwalk
Ann Arbor, Michigan 48208-3266
Telephone: (313) 995-0300
Fax: (313) 995-4004
E-Mail (Internet): hillary.handwerger@ncms.org
Director, MIRC: Ms. Hillary Handwerger

A nonprofit consortium of manufacturing companies in North America whose goal is to spur corporate research and increase competitiveness. MIRC offers an online database that lists 30,000 documents, including NTIS files beginning in 1969.

SEATTLE PUBLIC LIBRARY
Pacific Rim Project Business Information Services
1000 Fourth Avenue
Seattle, Washington 98104
Telephone: (206) 386-4636
Fax: (206) 386-4634
Coordinator: Ms. Betty Tonglao

SEMATECH
2706 Montopolis Drive
Austin, Texas 78741
Telephone: (512) 356-3000
Fax: (512) 356-3083
Chief Executive Officer: Mr. William Spencer
Librarian: Ms. Marilyn Redmond
Telephone: (512) 356-3442
Strategic Data and Analysis Group:
Ms. Madeline Dovale
Telephone: (512) 356-3834
Fax: (512) 356-3083

Nonprofit cooperative venture of U.S. manufacturers and equipment and materials suppliers to jointly develop advanced semiconductor manufacturing technologies. Founded in 1987. Provides translations of Japanese business and technical articles to members.

SEMICONDUCTOR RESEARCH CORP.
4501 Alexander Drive
Suite 301
P.O. Box 12053
Research Triangle Park, North Carolina 27709
Telephone: (919) 541-9431
Chief Executive Officer: Mr. Larry Sumney

Industry consortium founded in 1982 to fund semiconductor-related research on U.S. university campuses.

SEMI (Semiconductor Equipment Materials International)
805 East Middlefield Road
Mountain View, California 94043-4080
Telephone: (415) 964-5111
Fax: (415) 967-5375
President: Mr. William H. Reed
Technology: Mr. Scott Young, Director

Trade association for the semiconductor and flat panel display equipment and materials industry.

ACADEMIA

Stanford University
U.S. Japan Technology Management Center
322 McCullough
Stanford, California 94305-4055
Telephone: (415) 723-2094
Fax: (415) 723-4659
E-Mail: INFO@FUJI.STANFORD.EDU
Director: Dr. Robert A. Burmeister

University of Wisconsin-Madison
International Engineering Program
1500 Johnson Drive
1018 Engineering Research Building
Madison, Wisconsin 53706
Telephone: (608) 263-2191
Associate Dean Thomas W. Chapman

University of Wisconsin-Madison
Department of Engineering
Professional Development
1527 University Avenue
Madison, Wisconsin 53706
Telephone: (608) 262-4810
Fax: (608) 262-6707
Professor James L. Davis

University of Wisconsin-Madison
Biotechnology Center
287 Enzyme Institute
1710 University Avenue
Madison, Wisconsin 53705
Director, Information Resources Facility: Ms. Efrat Linvy
Telephone: (608) 262-1966

University of California at San Diego
Center for Magnetic Recording Research
La Jolla, California 92093-0401
Telephone: (619) 534-6213
Fax: (619) 534-2720
Manager, Information Services: Ms. Dawn Talbot

University of Washington
Department of Technical Communication
Technical Japanese Program
12 Engineering Library
FH-40
Seattle, Washington 98195
Telephone: (206) 543-7610
Fax: (206) 685-3264
Director: Dr. Michio Tsutsui

New York University
Japanese Translation Project
Courant Institute of Mathematical Sciences
251 Mercer Street
New York, New York 10012
Telephone: (212) 998-3067
Fax: (212) 995-4121
Director: Dr. Susan Goldman

University of California-Berkeley
Computer Science Division
571 Evans Hall
Berkeley, California 94720
Telephone: (510) 642-1469
Fax: (510) 642-5775
E-Mail: harrison@cs.berkely.edu
Contact: Professor Michael A. Harrison

CONSULTANTS/SERVICE PROFESSIONALS

AGENT INTELLIGENCE GUIDANCE SYSTEM
OnLoQ (order agent)
1172 Old Alameda Pt.
Alameda, California 94501
Telephone: (510) 521-4375
Agent Software Contact: Mr. J. Mena

Software that pinpoints the databank with intelligence needed in areas including advertising, marketing, business, competitive industry intelligence, intellectual properties, Japan, new technologies, and computer software and hardware. It also provides online services offering full text coverage of thousands of trade, business, and technological publications around the world.

BLAKELY & ASSOCIATES
503 Beacon Street
Alton, Illinois 62002
Telephone: (618) 462-0856
Fax: (618) 474-2109

Contact: Mr. Stephen W. Blakely

Services include development of market-driven strategies and tactics, competitive situation analysis, market research and analysis, and acquisition candidate profiles.

MR. DONALD C. GORHAM
12900 Old Columbia Pike
Silver Spring, Maryland 20904
Telephone: (301) 384-9512

Over 50 years of translating, interpreting, and consulting on Japanese business, technical, and legal matters.

FENWICK & WEST
Two Palo Alto Square
Palo Alto, California 94306
Telephone: (415) 494-0600
Fax: (415) 494-8022
Contact: Mr. Fred M. Greguras

Washington Office
1920 N Street, N.W.
Suite 650
Washington, D.C. 20036
Telephone: (202) 463-6300
Fax: (202) 465-6520

A 90-lawyer firm that specializes in venture capital and emerging companies, intellectual property, litigation and dispute resolution, mergers and acquisition, and representing international Pacific Rim companies.

GALAXY SYSTEMS, INC.
2004 17th Street, N.W.
Washington, D.C. 20009
Telephone: (202) 939-8856
Fax: (202) 667-5303
Contact: Ms. Mary Kate O'Hare

Provides information, translation, and travel services for Japanese businesses. Services include Nippon Information Services, which specializes in a variety of communication and information services in Japanese and in English; publishes weekly report of translation from the U.S. press; Japan Associates Travel, a full service travel agency serving both individuals and organizations; and Robotech, which brings Japanese and American companies together with technology transfers, licensing agreements, and technical information exchanges.

ISTA, INC.
950 Conestoga Road
Suite K-46
Rosemont, Pennsylvania 19010
Telephone: (215) 527-4538
Fax: (215) 527-2041
Contact: Dr. Alan K. Engle

Serves technology needs between Japan and the U.S. by providing targeted analysis, consulting and liaison help, access to databases, grey literature, newspapers, journals, and reference books.

JAPAN TECHNOLOGY INFORMATION & EVALUATION SERVICE (J-TIES)
503 Bonne Akasaka
8-13-13 Akasaka, Minato-ku
Tokyo 107, Japan
Telephone: 81-33-423-2400
Fax: 81-33-470-4141
Contact: Mr. Carlton Williams

U.S. Office
University of Maryland-College Park
College Park, Maryland 20742
Telephone and Fax: (301) 986-0645

Provides surveillance of technical and business trends in Japan; maintains a database and a patent retrieval system, and surveys Japanese company's R&D strategies and activities.

JAPANESE BUSINESS CONSULTING, INC.
1374 Telegraph Hill Drive
Salt Lake City, Utah 84123
Telephone: (801) 268-8959
Fax: (801) 268-8928
Contact: Mr. Douglas K. Bringhurst

Helps companies compete in Japanese markets by providing market research, marketing, strategic planning, government lobbying, interpretation, technical translation, and Japanese typesetting.

PROFESSIONAL ADVANCEMENT ENTERPRISES
2182 Saginaw S.E.
Grand Rapids, Michigan 49506
Telephone: (616) 956-9443, (800) 421-1943
Fax: (616) 956-7973

Offers translation, typesetting and interpreting services, as well as international protocol training for business development.

STEIN ASSOCIATES, INC.
4901 Hornbean Drive
Rockville, Maryland 20853
Telephone: (301) 924-4520
Fax: (301) 924-3847
Contact: Mr. Marvin Stein

Market research with an emphasis on Japan and Asia. Technical translation and document acquisition.

STEWART JAPAN/U.S. BUSINESS INTERFACE, INC.
1001 Craig Road, Suite 260
St. Louis, Missouri 63146
Telephone: (314) 569-9849
Fax: (314) 569-9862
Contact: Dr. Fumia Yoshikawa

Services include representation, negotiation, venture analysis, consultation, market research, language services, and seminars.

TECHSEARCH INTERNATIONAL, INC.
9430 Research Boulevard
Suite 400
Austin, Texas 78759
Telephone: (512) 343-4508
Fax: (512) 343-4509
President: Ms. Jan Vardaman

Produces the Japanese Technical Abstracting Service (JTAS), which provides a link to technical developments of the Japanese computer electronics and semiconductor industries. JTAS consists of abstracts of technical articles from *Denshi Zairyo, Nikkei Electronics, Nikkei Microdevices*, and *Semiconductor World*. JTAS is distributed monthly on floppy disk and costs $5,000 a year. A keyword search of the JTAS database is also available for $100 per month per topic.

VENTURELINK USA
West Coast Office
BigBang Technology, Inc.
1425 Koll Circle
Suite 110

San Jose, California 95112
Telephone: (408) 453-0110
Fax: (408) 453-9115
Contact: Mr. Tamio Saito

Helps American entrepreneurs and corporations enter the markets of Japan and the Pacific Basin using a business-to-business matching service. Publishes a quarterly newsletter about Japan, featuring exclusive information on economic trends, tips for success in global marketing, case histories, and articles by Japan experts.

CORPORATIONS

E.I. DU PONT DE NEMOURS & COMPANY
D-6028
Wilmington, Delaware 19898
Telephone: (302) 773-1163
Fax: (302) 774-3154
Director, Technology Acquisition:
Dr. James E. Nottke

INTEL CORPORATION
Technology Management Group
Strategic Research
2200 Mission College Boulevard
MS RN 3-19
Santa Clara, California 95052
Telephone: (408) 765-9523
Fax: (408) 765-9223
Industry Analyst: Mr. Ryan Hoover

ROCKWELL INTERNATIONAL
Corporate Asia Pacific Technology
Liaison Office
P.O. Box 1085
1049 Camino Dos Rios
Thousand Oaks, California 91630
Telephone: (805) 373-4145
Fax: (805) 373-4672
Manager, International Research and
Technology Division: Dr. Stanley W. Zehr

Rockwell International Science Center
Palo Alto Laboratory, Suite 400
444 High Street
Palo Alto, California 94301
Telephone: (415) 325-7145
Fax: (415) 325-2007
Contact: Dr. Jim F. Martin

3M CORPORATION
P.O. Box 33800
St. Paul, Minnesota 55144
Telephone: (612) 733-0388
Fax: (612) 733-2094
Staff Vice President, International Operations,
Research and Development:
Dr. Geoffrey C. Nicholson

3M Information Services
Building 21-BW-02
St. Paul, Minnesota 55144
Telephone: (612) 778-7525
Fax: (612) 778-6364
Supervisor: Ms. Claire Zigmund Stokes

Information Link
201-2S-00, 3M Center
Saint Paul, Minnesota 55114-1000
Telephone: (612) 736-2834
Fax: (612) 736-0902
E-Mail: US296752@MRGATE@ATLAS
Editor: Mr. Gene Danilenko

Internal newsletter published by 3M Corporate Technical Planning and Coordination. It covers publications on company, cultural, and

technical information, patents, and current events.

WESTINGHOUSE ELECTRIC CORPORATION
1 Gristmill Court
Suite 606
Baltimore, Maryland 21208
Telephone: (410) 765-7324
Fax: (410) 765-9684
Vice President, Technology, Electronics System Group: Dr. Gene Strull

XEROX PALO ALTO RESEARCH CENTER (PARC)
3333 Coyote Hill Road
Palo Alto, California 94304
Telephone: (415) 812-4042
Fax: (415) 812-4028
Manager of Information Resources:
Dr. Giuliana A. Lavendel

DATABASE INFORMATION SERVICES

CHEMICAL ABSTRACTS SERVICE
P.O. Box 3012
Columbus, Ohio 43210
Telephone: (614) 447-3600
Fax: (614) 447-3713
Manager, Marketing Services:
Ms. Janice E. Mears

Database monitors over 10,000 titles a year. As of 1988, almost 54 percent of the over 80,000 patents added to the database were of Japanese origin. Online databases include JICST-E and STN, an international online network in North America.

DERWENT, INC.
Suite 401
Dolley Madison Blvd.
Mclean, Virginia 22101
Telephone: (703) 790-0400, x109
Fax: (703) 790-1426
President: Mr. Jeremy Sergeant
Online Marketing Executive for North America: Ms. Ginger Roberts

Leading provider of scientific and technical intelligence to business, industry, government and research institutes throughout the world. They process approximately 8,000 patent documents from Japan each week. They provide five major services backed by the World Patents Index online database including Chemical Patents Index, Electrical Patents Index and World Patents Abstracts.

NIKKEI TELECOM
(Nihon Keizai Shimbun, Inc.)

Information Service Secretary
Databank Bureau
1-9-5 Ohte-machi
Chiyoda-ku, Tokyo 100-66, Japan
Telephone: 81-35-294-2407
Fax: 81-35-294-2411
U.S. Office
1325 Avenue of the Americas
Suite 2500
New York, New York 10019
Telephone: (212) 261-6240
Databank Sales Representative: Mr. Pier Friend

Sales Agent In the U.S.:

Mitsui & Co. (USA), Inc.
200 Park Avenue
New York, New York 10166-0130
Telephone: (212) 878-0937
Fax: (212) 878-0998
Contact: Ms. Seema Sherma

Nikkei Telecom Japan News & Retrieval is an online service developed by Nihon Keizai Shimbun, Inc., publisher of Japan's premier economic newspaper. Nikkei Telecom I has complete corporate financial for all publicly listed Japanese companies and coverage of 10,000 Southeast Asian companies. Nikkei Telecom II offers some extra features including real time tick-by-tick data on stocks, futures, and options.

TEIKOKU DATABANK, LTD.
2-5-20 Minami-Aoyama
Minato-ku, Tokyo 107, Japan
Telephone: 81-33-404-4309
Fax: 81-33-404-2164
Contact: Mr. Yoshio Goto

In the United States:

750 Lexington Avenue, 28th Floor
New York, New York 10022
Telephone: (212) 486-2637
Fax: (212) 486-2638
President: Mr. Michio Hamaji

Teikoku (TDB) is Japan's oldest credit reporting company. TDB compiles detailed credit reports on over 2 million Japanese companies. In the Spring of 1991, TDB introduced an English language online database. This database is available on DIALOG and Nikkei Telecom. Custom credit reports are available for $350.

COMLINE BUSINESS DATA, INC.
1-12-5, Hamamatsu-cho
Minato-ku, Tokyo 105, Japan
Telephone: 81-35-401-4567
Fax: 81-35-401-2345
Managing Director: Mr. Hal Morimoto

Since 1986, Comline has been the premier provider of news on Japanese high technology, science and business. This year, Comline will begin to provide full English translations of corporate reports listed on the first and second sections of the Tokyo Stock Exchange as well as Over-the-Counter companies. This new database, COMLINE Fundamental Data, is one of the databases whose development was funded by the Database Promotion Center.

DIALOG INFORMATION RETRIEVAL SERVICE
3460 Hillview Avenue
Palo Alto, California 94394
Telephone: (800) 334-2564
(415) 858-3785
Fax: (415) 858-7069
Director of Marketing: Mr. Richard DeTurck
Senior Information Specialist:
Dr. LeeAnn Gorthey

EL-NET
Electronic Library
KORINZU 8
8-11-13 Nishi-Gotanda
Shinagawa-ku, Tokyo 141, Japan
Telephone: 81-33-779-1211
Fax: 81-33-779-1227

Database of over 37 newspapers and 250 magazines, in Japanese, covering industry, markets, finance, economics, politics, and general news that allows not only searching of

index terms and free text terms from articles but also allows the searcher to order, using a simple command, fax copies of the original full-text Japanese documents to be sent to him/her in seconds.

G-SEARCH
8F, Houkou-Kowa bldg.
1-2-4, Tsukiji, Chuo-ku, Tokyo 104 Japan
Telephone: 81-35-565-1480

Agent in the U.S.:

Japanese Language Services
186 Lincoln Street
Boston, Massachusetts 02111
Telephone: (617) 338-2211
Fax: (617) 338-4611
Contact: Mr. Carl Kay

G-Search offers a comprehensive full-text news database of over 2.3 million records from Japan's leading business publications and general print media. Specialized files also contain marketing information, information on new product releases and research developments in high technology fields, an index of titles of articles from over 600 Japanese technical journals, macroeconomic data, corporate press releases, and a report of Japanese court decisions related to intellectual property.

TRANSLATION SERVICES

AMPAC, INC.
5713 Edsall Road
Alexandria, Virginia 22304
Telephone: (703) 823-9773
Fax: (703) 823-1138
Contact: Mr. Tim Rowe

An Asian language communications, typesetting and publishing service. In-house translation and typesetting, desktop publishing, computer graphics, Asian language word processing and phototypesetting systems.

BERKELEY SCIENTIFIC TRANSLATION SERVICE
2161 Shattuck Avenue
Suite 315
Berkeley, California 94704
Telephone: (510) 548-4665, (800) 488-9884
Fax: (510) 548-4666
Modem: (510) 548-4667
E-Mail: 71773.1422@CompuServe.Com
Contact: Mr. Rob Sellin

Specializes in technical, industrial, and scientific translations into English from all languages. Offers expert translation of English manuals, brochures, contracts and patents into other languages. Provides interpreters and international patent location and delivery services. Also offers typesetting and desktop publishing of manuals, brochures, proposals, and books.

DIPLOMATIC LANGUAGE SERVICES, INC.
1117 North 19th Street
Suite 800
Arlington, Virginia 22209
Telephone: (703) 243-4856, (800) 642-7974
Fax: (703) 358-9189
Contact: Mr. John B. Ratliff III

Exclusively offers scientific and technical translations. Offers services for IBM-compatible and Apple computers, fax, modem, and desktop publishing.

DON HANK TRANSLATION AGENCY
3013 Main Street
Conestoga, Pennsylvania 17516
Telephone: (717) 872-8942
Fax: (717) 872-5822
Contact: Mr. Donald E. Hank

Specializes in technical translation, using both in-house production and translation staff and freelance technical translators. Also has expertise in food science, chemical engineering, and medical research.

INFOX LIMITED
FKD Building
128 Sakamoto-cho, Hodogaya-ku
Yokohama 240, Japan
Telephone: 81-45-332-6048
Fax: 81-45-332-6052
Contact: Mr. Junzo Tokunaga

Technical translation from Japanese to English in the areas of biotechnology, molecular biology, food technology, and plant pathology.

INTERLINGUA, INC.
27520 Hawthorne Blvd.
Suite 230
Rolling Hills Estates, California 90274
Telephone: (310) 544-8552
Fax: (310) 544-4998
Translation Fax: (310) 544-1271
E-Mail: 71042.242 CompuServe
Chief Executive Officer: Mr. David Andrews

Offers quick computerized translation between Japanese and English. Uses state-of-the-art artificial intelligence software developed by Fujitsu. Also provides delivery of final documents.

INTERNATIONAL COMMUNICATIONS EXCHANGE
15247 Streamside Court
Dumfries, Virginia 22026
Telephone: (703) 680-1502
Fax: (703) 680-4578
Contact: Ms. Mitsuko Mask/Mr. Bob Mask

Helps to identify specific market niches in order to develop a competitive strategy for penetrating the Japanese marketplace. Services include information database development, translation, and conference support services, including interpretation, bilingual administrative conference support and bilingual presentation materials.

JAPANESE LANGUAGE SERVICES
186 Lincoln Street, 4th Floor
Boston, Massachusetts 02111
Telephone: (617) 338-2211
Fax: (617) 338-4611
Contact: Mr. Carl Kay

Specializes in technical translation, desktop publishing and business cards. Can also do document acquisition and database searches in Japanese. Expertise in facilitating software and technical communications know-how licensing between U.S. and Japan. Cultural training seminars and consulting on machine translation, Japanese OCR, on-line databases, and translation management.

JAPANESE TRANSLATION SERVICE
17215 Ernadale Avenue
Cleveland, Ohio 44111
Telephone: (216) 252-0777
Fax: (216) 252-0777
Contact: Ms. Sachiko Mizukami Duffy

Specializes in computer, engineering, industry & technology, legal, and general commercial translation. Other services include interpretation, abstracts and summaries, audiovisual services, cross-cultural consulting, and language training.

JAPANESE TRANSLATION TEAM
RR 2, Box 909
Canaan, New Hampshire 03741
Telephone: (603) 523-9656
Fax: (Same as above - Auto Transfer)
Contact: Mr. Gerald T. Peters

Experience translating technical literature, specializing in hard sciences. Other fields of expertise included biology, physics, electronics, and patents.

JAPANIC
U.S. Office
1911 Rose St.
Berkeley, California 94709
Telephone: (510) 527-7537
Fax: (510) 527-0162
Contact: Mr. Scott McGillivray

Japan Office
#1-1002 Miyako-Dori Danchi
3-18 Honen-cho
Chikusa-ku, Nagoya 464, Japan
Telephone: 81-52-722-7181
Fax: 81-52-711-9343
Contact: Mr. John M. Shields

Specializes in translating technical articles and monographs on original products and research for international publication. Emphasizes Japanese and English language pair translations. Offers marketing, advertising, and copywriting services for the Japanese market. Also offers translation for patents, contracts and legal communications.

KANZEN TECHNICAL TRANSLATIONS, INC.
1801 NW Upshur Street
Portland, Oregon 97209-1700
Telephone: (503) 221-3043
Fax: (503) 221-3053
Contact: Mr. Allan Hunter

Specializes in translating technical documentation including R&D reports, patents, journal articles, legal agreements, financial reports, and technical manuals and marketing materials.

KANJI-FLASH SOFTWORKS
P.O. Box 3119
Gaithersburg, Maryland 20885-3119
Telephone: (301) 279-2678
Fax: (301) 279-2598
Contact: Mr. Craig Van Degrift

Specializes in software to aid in comprehension and use of technical Japanese kanji. Produced accompaniment to *Basic Technical Japanese* by Daub, Bird and Inoue.

RALPH MCELROY TRANSLATION COMPANY
P.O. Box 4828
Austin, Texas 78765
Telephone: (512) 472-6753, (800) 531-9977
Fax: (512) 472-4591, 479-6703
Contact: Ms. Shelly Orr Priebe

Provides technically accurate custom translations from every language in any subject matter. Also offers foreign patent and document retrieval service.

NATIONAL TRANSLATION CENTER (NTC)
Cataloging Distribution Service
Library of Congress
Washington, D.C. 20541-5017
Telephone: (202) 707-0103
Fax: (202) 707-6147
Technical Information Specialist:
Ms. Karen Sturges-Vera

The NTC serves as a national depository and information source for locating unpublished English translations of foreign literature in the natural, physical, and medical sciences. The collection contains approximately 400,000 translations including thousands from Japanese and an additional 600,000 citations to translations held at other locations.

NORTHERN CALIFORNIA PATENT TRANSLATION & CONSULTING SERVICES
1181 Chess Drive, #202
Foster City, California 94404
Telephone: (415) 349-3610
Fax: (415) 349-4124
Contact: Mr. Alexander Shkolnik

Services include filing patent applications in Japan, ordering translations of Japanese patent documents, and conducting patent searches of Japanese patent documents.

SUZUKI, MYERS & ASSOCIATES, LTD.
P.O. Box 852
Novi, Michigan 48376
Telephone: (313) 344-0909
Fax: (313) 344-0092
Contact: Ms. Akiko Sakuma

Services include simultaneous interpretation. Expertise includes negotiations, transactions, consulting, quality engineering, and sales & marketing materials.

U.S.-JAPAN TRANSLATIONS, INC.
Japanese Technical Translations
504 Bullan
Austin, Texas 78746
Telephone: (800) 798-7527, (512) 327-8102
Fax: (512) 327-3199
Contact: Mr. Bruce Gardner

Specializes in Japanese technical and scientific translations for the semiconductor, computer, and software industries. Areas of expertise include biochemistry, electrical engineering, medicine, metallurgy, and polymer science.

PUBLICATIONS

DIANE Publishing Co.
600 Upland Avenue
Upland, Pennsylvania 19015
Telephone: (215) 499-7415
Fax: (215) 499-7429
Contact: Mr. Herman Baron

The Japan Catalog has over 100 entries of market studies, reports, books, and government documents. The catalog also contains material from think tanks, both here and abroad; non-profit organizations; small publishers; and large commercial international publishing organizations. Also available from DIANE Publishing is anime, or Japanimation, a mixture of sci-fi and action adventure, on video. All videos are subtitled in Japanese with original Japanese dialogue.

Japan Digest
205 N. Emerson Street
Arlington, Virginia 22203
Telephone: (703) 528-7570
Fax: (703) 528-8123
Contact: Mr. Kim Willenson

Daily and weekly executive summary of political, business, trade, technology and social issues news from Japan by FAX. A weekly edition is available by mail. It is edited by professional journalists, based on a careful reading of Japanese newspapers and magazines, and the reports of *Kyodo News,* Japan's premier news agency. $995, 1 year; weekly, $595/annual

Japan Technology Highlights
P.O. Box 7445
Northridge, California 91327
Telephone: (818) 360-3955
Contact: Mr. Hiroshi Kimura

Bi-weekly journal since 1984, featuring translated articles from Japan's *Nikkan Kogyo Shimbun*, the premier source for science and technology information. Each issue contains between 16 and 20 pages of reviews, abstracts, and briefs of the most current technological events and discoveries announced in Japan. Topics covered include semiconductor and superconductor devices and materials, electronic and computer science, robotics and artificial intelligence, biological and medical sciences, chemistry, and automobile and automotive science. $295/year.

Japan Technical Affairs
301 North Harrison Street
Suite 484
Princeton, New Jersey 08540-3512
Telephone: (609) 466-2281
Publishing Editor: Mr. Richard J. Chafey

An independently published quarterly publication dealing with Japanese scientific and technological developments and related commercial, economic, management, and competitiveness issues. $60/year.

Maruzen Co., Inc.
1-4-14, Kyobashi Chuo-ku
Tokyo 104, Japan
Telephone: 81-33-271-6088
Fax: 81-33-271-6082
Director, Information Service Division:
Mr. Ken I. Teramura

Provides a comprehensive range of information services and operations in publishing, export, import and retail sales. Also provides electronic information services from countries such as the U.S.A., France, England and Japan. Key clientele include universities, corporations, and libraries, as well as individual researchers.

Neo Japan
NeoConcepts
510 Woodhaven Court
Aptos, California 95003
Telephone: (408) 685-8818
Publisher: Mr. Sheridan M. Tatsuno

A monthly analysis of emerging computer, semiconductor, and new media technologies and markets. $395/year. Parent company also offers a variety of newsletters, seminars, reports, videotapes, and consulting on emerging Japanese and U.S. computer, semiconductor, and multimedia technologies.

Morningstar, Inc.
53 W. Jackson Blvd.
Suite 460
Chicago, Illinois 60604
Telephone: (312) 427-1985
Fax: (312) 427-9215
Contact: Ms. Susan E. Bray

An American financial publishing company with a new bi-weekly service that tracks 700 of Japan's leading companies. *Morningstar Japan* provides up-to-date financial statistics and concise editorial analysis and news. Offers special three-month U.S. trial subscription for $55. $495/year.

Nikkei Weekly
(Formerly *The Japan Economic Journal*)
1221 Avenue of the Americas
Suite 1802
New York, New York 10020
Telephone: (212) 512-4579
Fax: (212) 512-4550
Contact: Mr. Shigeki Miyagi

Weekly newspaper of translated articles from Japan's daily financial newspaper, *Nihon Kezai Shimbun*. Covers the world of Japanese finance from politics and industry to weekly transactions of the Tokyo Stock Exchange. $108/year.

HTE Research, Inc.
400 Oyster Point Blvd.
Suite 220
South San Francisco, California 94080
Telephone: (415) 871-4377
Fax: (415) 871-0513
Contact: Mr. Steve Z. Szirom

Publishes **Semiconductor Industry and Business Survey,** which offers news, facts, analysis, commentary, opinion, trends, views, and reports on the international semiconductor industry. It also publishes reports on the industry. The newsletter is published 18 times a year. HTE offers the SIBS plant site database, which has over 950 records on worldwide semiconductor plant sites, organized by geography, by company, by technology, by products and by plant activity. Also operates SIBS On-Line, a direct, on-line access to the SIBS newsletter back-issue database using a personal computer and modem for market research.

This directory was prepared by the Japan Information Access Project. If you have any questions or corrections, please contact us directly at (202) 332-5224; Fax, (202) 332-6841.

Biographies

Biographies of Speakers and Moderators

Yoshinari Akeno is deputy director of the Science and Technology Information Division of the Science and Technology Promotion Bureau of Japan's Science and Technology Agency (STA). He has worked for STA since 1983 and has served in the Nuclear Safety Policy Division of the Nuclear Safety Bureau, the Policy Division of the Science and Technology Promotion Bureau, the Power Reactor Development Division, and the Nuclear Fuel Division of the Atomic Energy Bureau. Mr. Akeno received his Bachelor of Science in nuclear engineering in 1982 from Nagoya University.

David Andrews is chief executive officer of InterLingua, Inc. (Los Angeles), a provider of liaison services and machine translation to U.S. and Japanese companies. He has been actively involved in the market evaluation, research, and planing of machine translation systems since 1988 and has extensive experience in end-user applications of the technology. Before joining InterLingua in 1992, Mr. Andrews was managing partner of The Stratagem Group, a marketing consultancy specializing in high technology products in Japan, Europe and the United States. His clients included many of the world's largest technology companies, including Fujitsu, Hewlett Packard, IBM, and Xerox. He retains board positions at The Stratagem Group and Primetime Publicity (U.K.) Ltd. A native of the United Kingdom, Mr. Andrews graduated from Southend College of Technology in 1966. He holds patents in consumer packaging technology and has been awarded numerous design awards.

Robert W. Brown is an electronics engineer at the U.S. Army Communications-Electronics Command at Fort Monmouth, New Jersey. He has been engaged in the fields of communication and electronics research and development for over 30 years. Currently he is active in the establishment of cooperative research programs between the U.S. and Japanese governments. Mr. Brown has a Bachelor of Science in electrical engineering from City University of New York.

Robert A. Burmeister is Director of the U.S.-Japan Technology Management Center, and Professor (consulting) of electrical engineering at Stanford University. He has been actively involved in managing academic research programs at Stanford and elsewhere since 1988. Prior to this, he was with the Hewlett-Packard Company in Palo Alto,

California, where he held a number of technical and managerial positions, including Laboratory Director within Hewlett-Packard Laboratories. Professor Burmeister has served on a number of advisory groups to agencies of the federal government, panels of the National Research Council, and external advisory boards of several universities. He has had close ties with the technical community in Japan for the past two decades, and has been both a speaker and a participant in many technical meetings and symposia in Japan and Europe. He receive his Master of Science and Ph.D. degrees in material science from Stanford University.

Joseph E. Clark is acting director of the Office of International Technology Policy and Programs at the Technology Administration of the U.S. Department of Commerce. He was the Deputy Director of the National Technical Information Service (NTIS) from 1983 to 1992. He also served as the U.S. co-chairman of the U.S.-Japan Science and Technology Information Task Force. From 1979 to 1983, he was responsible for policy issues relating to scientific information, patents and technological innovation at the White House Office of Science and Technology Policy. Before entering government service, Dr. Clark was employed by the Chemical Manufacturers Association and W.R. Grace & Co. He earned a Ph.D. in physical chemistry from the University of Windsor, Canada, and Bachelor and Master of Science degrees in chemistry from Villanova University in Pennsylvania. He has served as a visiting professor of engineering at Princeton University and was a Woodrow Wilson Fellow in public and international affairs at Princeton.

Howard Curtis is a senior research analyst in the International Liaison Office at MCC. He monitors developments in computer, software, and networking technologies in Japan and elsewhere in Asia. Prior to joining MCC, he was head of the Information Technology Section of the Mann Library at Cornell University. He is fluent in Japanese and has worked as a free-lance interpreter and translator. Mr. Curtis holds a Bachelor of Arts degree in East Asian studies from Princeton University and a Master of Business Administration from the Johnson Graduate School of Management at Cornell University. He studied Japanese and Japanese literature at Doshisha University, Kobe University and Middlebury College.

James L. Davis is an Assistant Professor of Technical Japanese in the Department of Engineering Professional Development at the University of Wisconsin-Madison, where he has been teaching technical Japanese and developing short courses related to Japanese science and technology since 1990. A licensed professional engineer in New York and Wisconsin, Dr. Davis has worked as a chemical engineer in industry and has conducted research as a Fulbright Graduate Fellow at Kyoto University in Japan. In addition to research publications and conference presentations in the United States and Japan, he has eight years of experience as a translator of Japanese technical documents. As a translator, his areas of specialty include organic chemistry, polymer science, and ceramics. He participated in translating *Isostatic Pressing: Technology and Applications*.

Alexander De Angelis is the Program Coordinator and Senior Manager of the National Science Foundation's Japan Program. Through the program, he provides support to American researchers to conduct research in Japan and otherwise seeks to open U.S. access to Japanese science and technology. From 1989 to 1991, Dr. De Angelis was Senior Program Manager of the U.S.-Japan Program of the same NSF Division. He was Director of NSF's Tokyo Regional Office, located in the U.S. Embassy in Tokyo, from 1986 to 1989. The first six months of his stay in Japan was as an NSF intern at the Japanese Ministry of Education, Science and Culture. He was Manager of NSF's China Committee from 1973 to 1981. He uses both Japanese and Chinese as working languages for negotiating and lecturing, and has published numerous reports in science and technology in Japan and China. Dr. De Angelis did doctoral work in Chinese and Japanese languages and literature at Cornell University. He received his Bachelor of Arts in Biology from New York University in 1967 and his Master of Arts degree in Asian Studies from Seton Hall University in 1969.

Richard DeTurck is the Director of Marketing for Dialog's Business and Finance Services. In this capacity, he directs the development and marketing of information services, including online databases, electronic clipping services, compact disc databases and search and retrieval software. He also oversees the advertising and training functions, manages Dialog's user conferences, and coordinates resellers in the business area. Prior to joining Dialog, Mr. DeTurck was the Managing Consultant for DRI's State and Local Government Consulting Practice in their San Francisco office and prior to that, he was Chase

Econometrics' Western Region Manager. His additional experience with Chase Econometrics was in their headquarters in Philadelphia as a market manager for their Micro/Mainframe Software Products division, as a product manager for their Natural Resource and Transportation Services, and as an economist and senior consultant in their Metal and Energy Forecasting services. Mr. DeTurck holds a B.A. degree in mineral economics from Pennsylvania State University and has completed additional coursework toward an MBA at Temple and Drexel Universities.

Pier Friend is a Databank sales representative for Nikkei Telecom, a subsidiary of the *Nihon Keizai Shimbun*, where he handles all distribution of Nikkei Databank services in North America, including news, market information, and corporate financial information through Nikkei's online services and other media. He lived and worked in Osaka for two years and is a graduate of Williams College.

Lawrence Garfield is a the National Center for Science Information Systems Database Search Operator for the National Science Foundation under contract with the KETRON Division of the Bionetics Corporation. He performs searches of Japanese-language databases in science, engineering, and business, which are produced and served by NACSIS, a body under the Japanese Ministry of Education, Science and Culture (Monbusho), in accordance with a NSF contract. Mr. Garfield is also a Japanese-English technical translator, providing translation of Japanese-language computer manuals and engineering patents.

Richard W. Getzinger was named Director of the AAAS Directorate for International Programs in November 1990. This directorate serves as the organizational focal point for the association's international activities. Major program areas include global change, developing countries, science and international security, and international scientific cooperation. He came to AAAS from the U.S. Department of State, where he served most recently in Tokyo as the U.S. Embassy's Counselor for Scientific and Technological Affairs. He has also served as Science Counselor in the U.S. Embassies in Ottawa, Canada and Vienna, Austria, as well as science advisor to U.S. Sen. Pete Domenici (R-NM). Dr. Getzinger holds a Bachelor of Science in engineering from the University of California-Los Angeles and a Master of Science and Ph.D. degrees in chemical engineering from the University of California-Berkeley.

Susan Goldman is a research scientist at the Courant Institute of Mathematical Sciences at New York University and Director of its Japanese Information Sciences project, established in 1982 as a center for analysis, translation, and dissemination of Japanese materials in parallel processing, supercomputers, machine translation, and robotics. She has initiated and written the curriculum for a three-year Japanese language sequence targeted at science/engineering majors, and in 1990, established the first U.S. graduate course in Japanese technical translation. As Project Director, she has supervised extensive tests of two Japanese-English machine translation systems. In addition, Goldman serves in an advisory capacity to assess research coming from Japan and provide information concerning the respective groups involved. Recent publications include the translation of the English edition of *Pax Computers--Highly Parallel Processing and Scientific Computing*, by Hoshino Tsutomu (Addison-Wesley, 1987) and testimony entitled *Japanese Technical Translation in the United States, A Report to the United States House of Representatives Subcommittee on Science, Research and Technology* at hearings of the committee. She received undergraduate and graduate degrees from Columbia University and spent two years as a postgraduate research fellow at Kyoto University, followed by seven years as a full-time faculty member at Osaka Institute of Technology.

LeeAnn Gorthey is the Senior Information Specialist covering patents and chemistry at Dialog Information Services. She was an information scientist at Henkel Research Corporation in Santa Rosa, Calif., and a research chemist/technical specialist at E.I. DuPont in Wilmington, Delaware. Dr. Gorthey has a Ph.D. in chemistry from Stanford University.

Hillary Handwerger has been Director of the Manufacturing Information Resource Center (MIRC) of the National Center for Manufacturing Sciences since 1988. She is responsible for the collection, maintenance, and dissemination of information on manufacturing and the business environment. MIRC provides research services, document and information delivery, and an online database and bulletin board system for its users. Prior to joining NCMS, Ms. Handwerger was Director of Information Resources at Domino's Pizza. She was also an information specialist at the Industrial Technology Institute, MDSI/Schlumberger, and the U.S. Fish & Wildlife Service. She is a consultant in information resource developments and teaches a course

in Management of Special Libraries at the University of Michigan. She has a Master of Library Science degree from the University of Michigan and a Bachelor of Science degree from Ohio State University.

Michael A. Harrison has been a professor of computer science at the University of California-Berkeley since 1963. His current research is in the creation of multimedia systems. He also researched switching theory, automata, formal language theory, protection in operating systems, electronic document systems, and programming environments. Dr. Harrison is a founder of Gain Technology, Inc., and has served for four years on the Computer Science and Technology Board of the National Academy of Sciences. He was chairman of a panel of the National Research Council on International Developments in Computer Science and recently chaired the National Science Foundation's JTEC Panel on Advanced Japanese Computing. Dr. Harrison is a member of several honorary and professional societies, has written five books and over 100 technical publications, and is an editor or consulting editor to several computer and mathematics periodicals. He received his Ph.D. from the University of Michigan and his Bachelor and Master's degrees in electrical engineering from Case Institute of Technology.

Glenn P. Hoetker is an international program analyst at the NASA Scientific Technical Information Program in Washington, D.C. His experience in Japanese information includes serving as a Japanese Information specialist for SCAN C2C, researching the influence of new information technology in Asia as a research fellow for the Thomas J. Watson Foundation, and conducting an extended study of sources of Japanese technical information. Hoetker earned his Master of Science degree in information and library science at the University of Illinois and his Bachelor of Arts degree in Japanese studies and mathematics at Earlham College.

Ryan E. Hoover is an industry analyst with Intel Corporation in the Technology Management Group. Mr. Hoover has been active in promoting the use of Japanese scientific and technical information by Intel since joining the company in 1986. He is proficient in searching Japanese patent information. He has been studying Japanese language and culture since 1990. Hoover's 23-year career involves working with scientific and technical information in both academia and private enterprise.

Hitoshi Inoue has been a Professor and the Director of the Science Information Research Division at the National Center for Science Information Systems (NACSIS) since 1986. Formerly he did research at the Research Center for Library and Information Science (RCLIS) at the University of Tokyo, and at the Center for Bibliographic Information at the University of Tokyo, the predecessor of NACSIS. His research interests include history of documentation, comparative and theoretical study of international librarianship, indexing procedures, and readability of books and museum documentation. Currently, he is studying Japanese studies and its relation to library collections in the United States, Europe, and East Asia. He belongs to a variety of academic societies, including the Information Processing Society of Japan and the Japan Society of Information and Communication Research, and holds memberships on a variety of committees, including the Japanese Committee on the Improvement of Information Access to Japan of the Japan Foundation, Center for Global Partnership. He received is Master of Science degree in Library Science from Columbia University in 1962.

Richard Iverson is president and chief executive officer of the American Electronics Association (AEA), the largest trade group representing U.S. high technology companies. He joined AEA after a 33-year career in commercial and defense electronics, serving in many capacities from engineer to project engineer to marketing management and as general manager and group executive. Prior to joining AEA in January 1986, Mr. Iverson was a Group Vice President for Gould Inc., where he was responsible for developing defense electronics. The last few years with Gould he was Senior Vice President responsible for corporate marketing and government relations, based in Washington, D.C. Mr. Iverson began his career as an engineer at Teledyne Ryan Electronics in 1952. He has served on the Council on Competitiveness, Vice Chairman of CORETECH, an industry/university research and development coalition, and on the Board of the Economic Strategy Institute. He graduated from San Diego State University in 1951 with a bachelor's degree in mathematics.

David Kahaner is a specialist in scientific computing for the Office of Naval Research's Asian Office. Prior to that, he was a group leader in the Center for Computing and Applied Mathematics and the National Institute of Standards and Technology, where he was responsible for scientific software development on both large and small computers. He

also worked in the Computing Division at Los Alamos National Laboratory. Dr. Kahaner is the author of two books and over 50 research papers. He also edits a column on scientific applications of computers for the Society of Industrial and Applied Mathematics. He obtained his Ph.D. in applied mathematics from the Stevens Institute of Technology.

Sharon Kemmerer has worked at the National Institute of Standards and Technology (NIST), Computer Systems Laboratory, in the Information Systems Engineering Division since 1986. Her duties include conformance testing and validation as it relates to the U.S. Department of Defense Computer-aided Acquisition and Logistic Support (CALS) initiative, assisting in managing the CALS programmatic efforts at NIST, and being a primary point of contact at NIST for technical issues associated with CALS information technology standards. Due to the nature of her CALS activities, Ms. Kemmerer has a broad-based exposure to many of the information technology standards which have been developed or are evolving through the ANSI and ISO communities. She has a Bachelor of Science degree in education from Shippensburg University and an MBA from Marymount College. She has published several NIST reports in conformance testing and an article in the periodical, *CALS Journal*, May 1992 edition.

A. Rahman Khan is the Chief of International Acquisitions at the National Technical Information Service's Office of Business Development. He is a member of the U.S.-Japan Science and Technology Information Task Force and co-chaired the Information Science and Technology Working Group of the Indo-U.S. Subcommission on Science and Technology. He was Executive Director of the Commerce, Energy, NASA, NLM, Defense Information Administrators Group (CENDI) from 1987 to 1988. Prior to joining government service, Dr. Khan served at the research facility of Henkel Corporation in Minneapolis, where he worked closely with researchers, strategic planners, and the legal staff as a manager of Technical Information Services from 1981 to 1985. He was at the Agricultural Chemical Division of FMC Corporation in New York from 1975 to 1980. Dr. Khan received his Ph.D. in information services from Rutgers University in 1987 and his Master of Science degree in entomology from the University of Delaware in 1974.

Mindy L. Kotler is president of the Japan Information Access Project, a nonprofit [501(c)(3)], educational organization dedicated to helping American and other international users learn how to obtain and understand Japanese scientific, technical, and business information. Prior to establishing the Japan Project, she managed her own Washington, D.C., consulting firm, Search Associates, Inc., which she founded in 1982. It tracked the politics and policies of international trade and technology. Ms. Kotler received her Master of Arts degree in international relations from Yale University and her Bachelor of Arts degree in government and history from Smith College. She is the author of *Information Gathering on Japan: A Primer* and writes regularly for various business journals.

Tamami Kusuda has been with the Japan Technology Program (formerly the Japanese Technical Literature Program) at the U.S. Department of Commerce, since 1987 as a consultant on Japanese technology. He assists the director of the Japan Technology Program in preparing annual technical summary reports on significant scientific discoveries and technical innovation occurring in Japan. Previously, Dr. Kusuda worked for the National Institute of Standards and Technology (NIST) from 1962 to 1986, finishing as the chief of the Building Physics Division. From 1955 to 1962, he worked at the Worthington Air Conditioning Company. He received a Ph.D. in mechanical engineering in 1955 from the University of Minnesota and graduated from the University of Tokyo in 1947, with a major in precision engineering and applied physics.

Nancy Lambert is recognized in the information community as a specialist in patent information, particularly online patent searching. She serves as a consultant to a number of database producers and online vendors, and she has published six papers and given many professional talks on patent information topics. Since 1986, she has been a patent information resource for all of Chevron Corporation and its subsidiaries. In 1974, she started work for the 3M Company as a patent information specialist and became senior technical information analyst and the principal chemical and polymer patent searcher at 3M. Ms. Lambert did two years of graduate work in chemistry at Princeton University before going on to Columbia University, where she received a Master of Science degree in library science. She received a Bachelor of Science degree with honors in chemistry from Carnegie Mellon University.

Giuliana A. Lavendel is manager of Information Resources at Xerox's Palo Alto Research Center in California. She runs a network of information centers and other services, supporting customers in the United States, Europe, and Japan. Business information and analysis is a specialty developed in support of corporate decisionmakers; much of this knowledge base is disseminated electronically. Some competitive tools are developed jointly with counterparts in Japan. Lavendel is a member of the Advisory Board for the National Technical Information Service (NTIS) at the U.S. Department of Commerce and has served as a board member for the California Library Authority for Systems and Services (CLASS). A native of Milan, Italy, she has a Ph.D. in classics, MBA, and a Master of Science in library and information science.

Ronald E. Lawson is Associate Director for Finance and Administrator at the National Technical Information Service. Previously he served as Trust Fund Secretary and Financial Manager of the National Archives Trust Fund Board from 1988 to 1991; Accounting Officer and Chief, Finance Branch of the National Archives and Records Administration from 1985 to 1988; and Regional Director of Finance at the General Services Administration from 1975 to 1984, after holding several accounting positions at GSA. Simultaneously, Lawson was an Instructor in public administration at Northeastern University from 1972 to 1985; an Adjunct Professor of management at Boston State College from 1974 to 1982; and a Professor in accounting from 1970 to 1985. He received a Master of Public Administration from Northeastern University in 1972, an MBA in accounting from the University of Pennsylvania's Wharton School of Business in 1963 and a Bachelor of Science degree in accounting from Northeastern University in 1961.

Geoffrey C. Nicholson is Staff Vice President of 3M's International Technical Operations, Research and Development. His prior international experience at 3M was as Executive Director, International Technical Operations from 1986 to 1989; Technical Director, International Operations from 1985 to 1986; Director, Technology and New Products, International Operations from 1980 to 1985; and Technical Director, Sumitomo 3M Ltd. from 1978 to 1980. Dr. Nicholson is a member of the American Chamber of Commerce in Japan, the Japan-America Society, and the Board of Directors of Sumitomo 3M Ltd. Born in England in 1938, he received his Bachelor of Science degree

from A.R.C.S., University of London, and his Ph.D. in 1963 from Imperial College, University of London. He received the 3M Carleton Society Award in 1991.

Takashi Nitto is the Manager of the Office of Planning at the Research Development Corporation of Japan (JRDC). He was transferred there from the Kyoto office, where he was the Administrative Manager of Basic Research of the Exploratory Research for Advanced Technology Program (ERATO) from 1987 to 1989. Previously he worked as the Liaison Officer of JRDC at Tsukuba Science City, and he worked at the Financial Affairs Division of JRDC from 1970 to 1980.

James E. Nottke was appointed to the newly created position of Director, Technology Acquisition of du Pont in 1992. Previously he had been Science Director for Polymer Science and Engineering and director of Advanced Materials, which included basic R&D in polymers, ceramics, high-temperature superconductors, and electro-optic materials. Prior to that, he spent 17 years in du Pont's Textile Fibers Department in research, manufacturing, marketing, and management assignments. He joined du Pont's Central Research Department in 1968, where he was the principle investigator on herbicide and dye precursors, fluoropolymers, and highly aromatic polymers, and held research assignments in the Elastomers and Plastics Departments. Dr. Nottke has a Ph.D. in organic chemistry from the University of Oregon and a Bachelor of Science in chemistry from the University of Illinois.

Keisuke Okuzumi is the promotion director of the Database Promotion Center, Japan. His responsibilities include promoting databases and the database industry of Japan, and advising, consulting, and training for database construction, operation, and services. He is also a member of the Japan Industrial Standard Committee for ISO/TC46 (Information and Documentation), the Patent Classification Advisory Committee of the Japan Patent Office, and a committee member of several information technology and standardization nonprofit organizations. Mr. Okuzumi previously worked at the Patent Data Center, Inc., developing a patent information system, a legal information retrieval system, and other applications for government and enterprises. Before Joining the Patent Data Center, he worked as a computer engineer at the Ministry of International Trade and Industry (MITI) to assist in the

planning, design, and development of an information system for use by administrative departments of MITI. Mr. Okuzumi received a Bachelor's degree in architecture from Kogakuin University in 1969.

Thomas E. Pinelli is as the Assistant to the Chief, Research Information and Applications Division at NASA Langley Research Center in Hampton, Virginia. He is a principal investigator with the NASA/Department of Defense Aerospace Knowledge Diffusion Research Project. He received his Ph.D. from Indiana University in Bloomington, Indiana.

Toshiyasu Sasaki has been the Executive Vice President of the Japan Information Center of Science and Technology (JICST) since 1990. In 1987, after serving as Director General of the Nuclear Safety Bureau of Japan's Science and Technology Agency, he joined the Power Reactor and Nuclear Fuel Development Corporation (PNC) as Executive Director. Previously, Mr. Sasaki was the Deputy Director of the Secretariat of OCED/NEA from 1983 to 1986. He was counsellor to the Embassy of Japan in Austria from 1975 to 1978, after having been with the Science and Technology Agency since 1969 and with MITI from 1957 to 1959. He graduated from Osaka University in electrical engineering.

Jeremy Sergeant is the President of Derwent Incorporated. He was previously marketing director of Derwent Publications in London, England. Prior to that, he was general manager of Derwent-SDC Search service, also in England. Sergeant has almost 15 years of experience in the online industry and has always been closely connected with the field of intellectual property, patents information in particular.

Yukiko Sone has been Deputy Information Manager of the Product Development Division of the Technology Research & Development Department of the Japan Information Center of Science and Technology (JICST) since 1991. She develops new-media products of JICST, such as CD-ROMs and research the possibility of other new products using the information resources in JICST. She also developed a sales and users management system of JICST's services during the time she served as Deputy General Manager of Marketing Division from 1988 to 1990, for which she was cited by JICST's Commendatory Committee in 1992. Previously, she worked in the Acquisition Division of JICST's Information Resources Department as a librarian. There, she was

involved in developing a computerized acquisition and management system for information resources from 1985 to 1987. She graduated from the National Junior College of Library Science.

Claire Zigmund Stokes is a supervisor in Information Services at 3M, where she has worked in various capacities since 1988. She has responsibility for monitoring Japanese information resources. Previous work experience includes chemical research at the Stamford Research Laboratories, American Cyanamid Corp., and head of reference and research services at the Science & Engineering Library at the University of Minnesota. Ms. Stokes has extensive experience using chemical, patent, and other technical online databases. She holds a Bachelor of Science degree in chemistry and Master of Arts degree in library science, both from the University of Minnesota.

Gene Strull was employed by the Westinghouse Electric Corporation from 1954 to 1992. In 1958, he started the first semiconductor device laboratory in a defense systems environment. In his last position as vice president for Technology of the Electronic Systems Group and general manager of the Advanced Technology Division, he was responsible for developing and manufacturing advanced electronic components required by Westinghouse. In 1993, the Westinghouse Advanced Technology Laboratories in Baltimore were renamed the Gene Strull Advanced Technology Laboratories. He has been a government consultant for many years, serving on the U.S. Army Science Board, NASA, and committees of the Defense Science Board, Naval Research Advisory Committee, and the National Academy of Sciences. Dr. Strull is a fellow at the Institute of Electrical and Electronics Engineers and was awarded the EASCON 1987 Government Industry Service Award. In 1991, he was awarded the IEEE Frederik Philips Award for outstanding accomplishments in the management of microelectronics and integrated circuit developments and their applications to aerospace systems. He received his Bachelor of Science degree in electrical engineering in 1951 from Purdue University, and his Master of Science and Ph.D. from Northwestern University.

Dawn E. Talbot is a librarian and the manager for information services at the Center for Magnetic Recording Research at the University of California, San Diego. She received her Bachelor's degree from Monash University and completed graduate studies in librarianship at the University of New South Wales. Prior to moving to California, she

held positions at the University of Sydney, Australia. As manager for information services at the center, an industry-university consortium, she established a model for acquiring and translating selected information from Japan for the recording industry. Active in this area since 1984, she has spoken at national meetings and acted as a consultant to government and private groups.

Betty Tonglao is a senior reference librarian at the Seattle Public Library. As senior librarian, she has been responsible for establishing and developing the Asian languages collection at the main library. For the past six years, she has been overseeing the development of the Pacific Rim Business Information Service. The service is now a statewide, multi-type library cooperative project initially privately funded. Mrs. Tonglao has addressed groups and conducted workshops throughout the United States and Canada.

Michio Tsutsui is an associate professor in the department of Technical Communication and the director of the Technical Japanese program in the College of Engineering at the University of Washington. He has taught Japanese at various institutions, including the University of Illinois at Urbana-Champaign, the Japanese School at Middlebury College, Vermont, and the University of California at Davis. He founded and directed the technical Japanese program at MIT from 1985 to 1990. Mr.Tsutsui's publications include *A Dictionary of Basic Japanese Grammar (The Japan Times)* and a number of articles on Japanese linguistics and technical Japanese. He has a Bachelor of Science in naval architecture from Osaka University.

Hisako Uchida is a counselor in International Programs at the Japan Information Center for Science and Technology (JICST). Since 1989, she has worked in international cooperation including the exchange of scientific and technical information and personnel. Mrs. Uchida was Director of JICST's EDP Division from 1985 to 1988, and was involved in R&D activities from 1962 to 1985. During this period, JICST developed many information processing systems, such as database production systems, information retrieval systems (batch and online), and vocabulary control systems. From 1958 to 1962, she worked in JICST's Abstracting and Indexing Department as an abstractor and indexer. Mrs. Uchida graduated from the department of Pharmaceutical Science at Chiba University in 1958. She has been a member of the Information Task Force under the U.S.-Japan Agreement on Coopera-

tion in Research and Development in Science and Technology, and a member of the I&D panel under the Japan-Federal Republic of Germany Agreement on Cooperation in the Field of Science and Technology.

Carlton Williams is a cooperative research student in Information Science at Tokyo University and an information science specialist with the Japan Technology Information and Evaluation Service (J-TIES). J-TIES performs technical paper collection, analysis, and abstracting across many technical fields for a variety of clients from the European Community and the United States. Additionally, J-TIES is developing a technical dictionary for use in English-Japanese machine translation. Mr. Williams received his Bachelor of Science degree in computer science from Tufts University in 1986 and his Master of Arts degree in Japanese studies from the Johns Hopkins University School for Advanced International Studies in 1992.

Phyllis Genther Yoshida is Director of the Japan Technology Program at the U.S. Department of Commerce. She implements the Japan Technical Literature Act, which helps U.S. scientists and engineers keep abreast of important Japanese scientific and technical literature and information, and she monitors Japanese technical activities and coordinates Commerce Department activities under the 1988 U.S.-Japan Science and Technology Agreement. Dr. Yoshida also teaches graduate courses on Japanese trade and technology policy at George Mason University in Virginia. Previously she worked as a trade policy analyst in the Commerce Department's Office of the Under Secretary for International Trade and on Japanese industry and trade issues in the Office of Industrial Trade. She held a Fulbright Fellowship at the University of Tokyo from 1983 to 1985, worked as an economic analyst at the Japan Economic Institute in Washington from 1980 to 1983. Dr. Yoshida received her Ph.D. in international relations in 1986, a Master of Arts in international affairs and East Asian Economies in 1978 from George Washington University, and a Bachelor of Arts in international relations from Carleton College in 1976.

Stanley Zehr serves in Rockwell's corporate Asia-Pacific Technology Liaison Office, with responsibility for bringing Asian technology to the various Rockwell divisions. He is also responsible for the technical aspects of worldwide licensing of Rockwell's basic MOCVD process patent. Since joining Rockwell in 1979, he has had a variety of technical,

management, and transfer to production responsibilities involving III-V compound semiconductor materials and devices, with special emphasis in optoelectronic devices, solar cells, optically triggered photoconductive switches, and MOCVD growth in InP-based epitaxial structures. Dr. Zehr received his BS and ScD degrees in materials science from MIT.

JOIS

The JICST Online Information System

Gives you immediate access to hundreds of thousands of Japanese R&D results

Through an agreement with the Japan Information Center of Science and Technology (JICST), NTIS makes available a major Japanese online information system. The JICST Online Information System (JOIS) provides references to hundreds of thousands of monographs, journal articles, and technical reports. The system operates on host main frame computers located in Japan, which may be reached through a local telephone network.

JICST-E

The English-Language Japanese Database

Scientific, technical, and medical information is available in English on the JICST-E database, which can be accessed with standard U.S. terminal equipment and English language commands. The database contains 1,100,000 records and is updated twice a month. The full text reports are in Japanese.

Other JICST Files

Japanese-Language Databases

Several Japanese-language files are also available. They require a computer terminal capable of sending, receiving, and printing Japanese characters. The JICST files available outside Japan are:

Name of database	Update frequency	Number of records
• JICST File on Science and Technology	twice a month	7,300,000
• JICST file on Medical Science in Japan	once a month	1,750,000
• Nikkan Kogyo File on New Technology and Products in Japan	once a week	190,000
• JICST File on Current Science and Technology Research in Japan	once a year	35,000
• JICST Holding List File (contains JICST resource materials)	once a month	500,000
• JICST Quick File (contains titles and bibliographic data of JICST collection without abstracts or keywords)	twice a month	1,150,000

JOIS may be searched through an arrangement with NTIS. For additional information, contact NTIS' Office of International Affairs, (703) 487-4819.

JTEC Reports

Evaluations by panels of top U.S. experts of Japanese developments in specific technologies

As the Japanese become leaders in research in targeted technologies, it is essential that the United States have access to the results. The Japanese Technology Evaluation Center (JTEC) provides the essential first step by alerting U.S. researchers to Japanese accomplishments by providing assessments of Japanese research and development (R&D) in selected technologies.

The assessments are performed by panels of about six U.S. technical experts from industry, academia, and Government. Panel members are leading authorities in the field, technically active, and knowledgeable of Japanese and U.S. research programs. Each panelist spends about one month of effort reviewing literature, making assessments, and writing reports on a part-time basis over a six-month period. Most panels go on extensive tours of Japanese laboratories.

The assessments focus on the status and long-term direction of Japanese R&D efforts relative to those in the United States. Other important aspects include the evolution of the technology, key Japanese researchers and R&D organizations, and funding sources. The time frame of the R&D forecasts is up to ten years, corresponding to future industrial applications in 5 to 20 years.

Panelists review timely source material, such as conference proceedings in the Japanese research community and results from recent technical committee meetings on Japanese national R&D projects and from contacts at R&D centers in Japanese high technology industries. The panel findings are presented to small workshops where invited participants critique the preliminary results. The panel final reports are available from NTIS:

- Bioprocess Engineering
  PB92-100213/BCS, PC $52.00/MF $20.50
- X-Ray Lithography
  PB92-100205/BCS, PC $38.00/MF $12.50
- High Definition Systems
  PB-91-100032/BCS, PC $52.00/MF $12.50
- Construction Technologies
  PB91-100057/BCS, PC $52.00/MF $12.50
- Advanced Composites
  PB90-215740/BCS, PC $38.00/MF $12.50
- Advanced Computing
  PB90-215765/BCS, PC $36.50/MF $12.50
- High-Temperature Superconductivity
  PB90-123126/BCS, PC $38.00/MF $12.50
- Advanced Sensors
  PB89-158760/BCS, PC $41.00/MF $9.00
- Advanced Materials
  PB86-229929/BCS, PC $32.00/MF $12.50
- Telecommunication Technology
  PB86-202330/BCS, PC $32.00/MF $12.50
- Biotechnology
  PB85-249241/BCS, PC $28.50/MF $12.50
- Computer Science
  PB85-216760/BCS, PC $25.50/MF $12.50
- Display Technologies
  PB92-100247/BCS, PC $52.00/MF $20.50
- Database Use and Technology
  PB92-100221/BCS, PC $38.00/MF $15.50
- Machine Translation in Japan
  PB92-100239/BCS, PC $38.00/MF $12.50
- Space Robotics
  PB91-100040/BCS, PC $52.00/MF $12.50
- Nuclear Power
  PB90-215724/BCS, PC $44.50/MF $12.50
- Space and Transatmospheric Propulsion
  PB90-215732/BCS, PC $38.00/MF $12.50
- CIM & CAD for the Semiconductor Industry
  PB89-138259/BCS, PC $28.50/MF $9.00
- Exploratory Research Program for Advanced Technology (ERATO)
  PB89-133946/BCS, PC $35.00/MF $9.00
- Optoelectronics & Microelectronics
  PB85-242402/BCS, PC $38.00/MF $12.50
- Mechatronics
  PB85-249019/BCS, PC $20.50/MF $12.50
- JTEC Program Summary
  PB92-119429/BCS, PC $38.00/MF $12.50

The National Science Foundation (NSF) is the lead support agency for JTEC. Other sponsors include the Defense Advanced Research Projects Agency (DARPA), the National Aeronautics and Space Administration (NASA), the Department of Commerce (DoC), and the Department of Energy (DoE).

☆ U.S. GOVERNMENT PRINTING OFFICE: 1993 — 3 4 1 - 8 3 5 / 8 3 0 8 7

Now available only from NTIS

Reports prepared for the

Commission on U.S.-Japan Relations for the Twenty First Century

consisting of

Edson W. Spencer (Chairman)	Lamar Alexander	James B. Hunt, Jr.
Peter G. Peterson	Frank Press	James D. Robinson, III
Donald H. Rumsfeld	Cyrus R. Vance	Paul Volcker
Henry Wendt	John C. Whitehead	

This prestigious group of Americans has drawn together in a privately-funded, non-partisan commission out of strong concern for the future of U.S.-Japan relations. They have all served in or as advisors to government and possess broad experience with Japan.

The Commission's objective is to encourage Americans to think long-term, to think of Japan as an ally as well as a competitor, and to expand our horizons of cooperation. For instance, new issues such as managing scientific and technical advancement permit simultaneous competition and cooperation and could lead to a U.S.-Japanese-European environmental alliance. Similarly, the frontiers of health and medicine are extended best through cooperation.

Working with a range of experts, the Commission stimulates research and dialog on major issues and makes public recommendations to promote America's long term interest in a healthy, balanced relationship with Japan. Interim recommendations already available are:

- Commission on U.S.-Japan Relations for the Twenty First Century Final Report: America's Stake in the Future of the U.S.-Japan Relationship - Issues and Recommendations
  PB92-114149/BCS, PC $17.50/MF $9.00
- Preparing for a Pacific Century: Exploring the Potential for Pacific Basin Cooperation
  PB92-114156/BCS, PC $27.00/MF $12.50
- The 1990's: Decade of Reckoning or a Decade of a New Partnership
  PB91-156653/BCS, PC $17.50/MF $9.00
- Scientific and Technical Cooperation between the U.S. and Japan: Issues and Recommendations
  PB91-219170/BCS, PC $17.50/MF $9.00
- Political/Security Relations of the U.S. and Japan in the Coming Decade
  PB91-156471/BCS, PC$17.50/MF $9.00
- Reassessing the U.S.-Japan Security Relationship in the Post Cold War Context
  PB91-207944/BCS, PC $17.50/MF $9.00
- Japan as Competitor
  PB91-156455/BCS, PC $17.50/MF $9.00
- America and Japan: How We See Each Other
  PB91-156430/BCS, PC $17.50/MF $9.00
- The U.S. and Japan: Collaborators and Competitors - Toward a More Competitive America
  PB91-156463/BCS, PC $17.50/MF $9.00
- Japanese Foreign Investment in Tennessee: A Case Study
  PB92-142066/BCS, PC $17.50/MF $9.00
- Japanese Foreign Investment in Hawaii
  PB91-156448/BCS, PC $17.50/MF $9.00
- Japanese Investment in North Carolina
  PB91-209270/BCS, PC $17.50/MF $9.00
- Japanese Investment in Oregon
  PB91-209288/BCS, PC $19.50/MF $9.00
- Adding an Environmental/Energy Dimension to the U.S.-Japan Alliance: Four Views on International Cooperation
  PB91-184820/BCS, PC $19.50/MF $9.00
- Foreign Assistance: In Need of Radical Reform
  PB92-142058/BCS, PC$17.50/MF $9.00
- What Next on Debt: An Examination of Strategies for Dealing with the Threat to the Global Economy Posed by Third World Debt
  PB91-156422/BCS, PC $17.50/MF $9.00

NTIS® Order Form

U.S. DEPARTMENT OF COMMERCE
Technology Administration
National Technical Information Service
Springfield, VA 22161

To order subscriptions, call (703) 487-4630.
TDD (for hearing impaired only), call (703) 487-4639.

(703) 487-4650
or FAX this form (703) 321-8547*

For Rush Service—1-800-553-NTIS

Rush service is available for an additional fee by calling the number above. Rush orders are usually shipped next day by *overnight* courier in the U.S. or by Air Mail outside the U.S. *Do not mail rush orders.*

*To verify receipt of your FAX order, call (703) 487-4679.

Please PRINT or TYPE.

Ship to address

DTIC Users Code ___________

Date ___________ Contract No. ___________ Last six digits

Company

Last Name First Initial

Title

Street Address

City/State/ZIP

Attention

Telephone number FAX number

Signature: ___________ (Required to validate all orders)

Payment

☐ Charge my NTIS Deposit Account _ _ _ _ _ - _

Charge my ☐ VISA ☐ MasterCard ☐ AMERICAN EXPRESS

Account No. ___________

Exp. _______ Cardholder's name ___________

☐ Check/Money order enclosed for $ ___________ (Payable in U.S. dollars)

☐ Bill me ✱—**Add $7.50 per order if full payment does not accompany order.** Purchase orders only accepted from Government agencies, educational institutions, or corporations in the U.S., Canada & Mexico.

Purchase Order No. ___________

For a copy of the latest NTIS price code conversion table, call (703) 487-4650 and ask for PR-360–3 for prices in the U.S., Canada, and Mexico. Ask for PR-360-4 for conversion table for foreign prices.

Order Selection

Please PRINT or TYPE.

Enter NTIS order numbers (Ordering by title alone will delay your order)	Customer Routing† (up to 8 digits)	Unit Price	Quantity			Specify density for tape orders			Internat'l Air Mail (see reverse)	TOTAL PRICE
			Paper Copy	Micro-fiche	Other	1600 bpi	6250 bpi	3480 cartridge		

†NTIS will label each item with up to eight characters of your organization's routing code.
Unless microfiche is specified, paper copy will automatically be sent.

Handling Fee *per order* U.S., Canada & Mexico–$3 Other countries–$4	
✱ Billing Fee, add $7.50	
GRAND TOTAL	

Please note:
Although NTIS cannot accept returns for credit or refund, we will gladly replace any item you requested if we made an error in filling your order, if the item is defective, or if it was received in damaged condition. Just call our Customer Service Department at (703) 487-4660.

A0000218673б1

Prices are subject to change.

9/93
All previous versions of this order form are obsolete

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★